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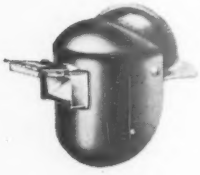

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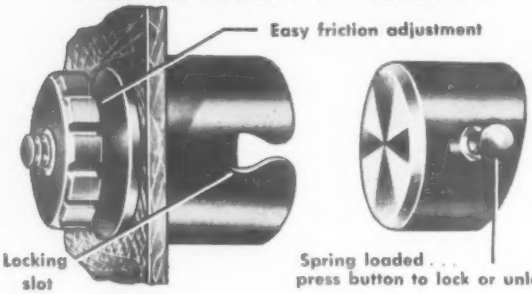

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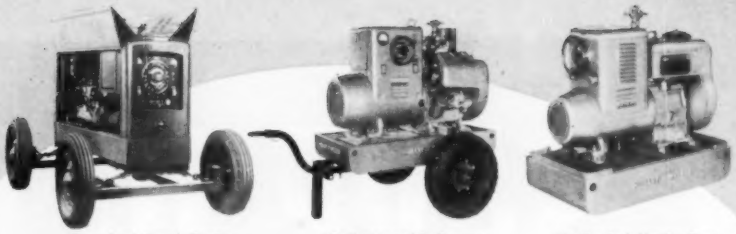

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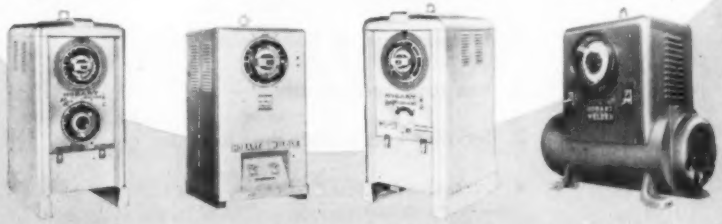

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Welding Engineer

DECEMBER, 1956
VOL. 41—No. 12

THE MAGAZINE OF JOINING
AND SEVERING OF MATERIALS

America's pioneer publication which, combined with The Acetylene Journal, has been devoted to the interest of the welding and allied industries since 1898

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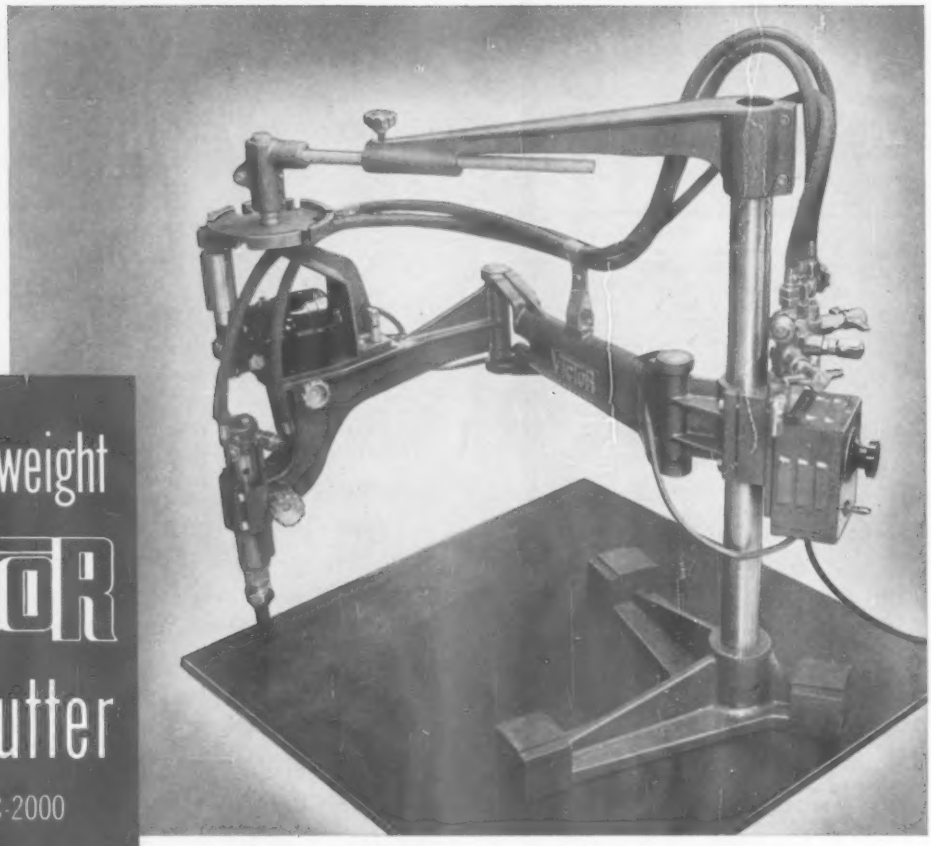

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GATHERING from all sections of the United States, this group participated in seminar on welding in bridge design, fabrication and construction. (See story below.)

MORE than 500 persons attended recent three-day welding show and demonstration held by E. R. Joseph Co., Norristown, Pa. Welding equipment and supplies were displayed by 15 suppliers. The show was held in the firm's new 4,000 sq ft building.

News

Lincoln holds bridge seminar

Bridge builders with an eye to the future met recently at the plant of The Lincoln Electric Co., Cleveland, to participate in a welding seminar on welding in bridge design, fabrication and construction. The four-day meeting was sponsored by Lincoln to aid designers and fabricators in developing efficient bridge designs in welded steel.

Present at this first seminar of a series to be held January through May, were as follows: Hary Brinkman; Harold Buckner; Charles H. Clarahan, Jr.; Clarence L. Conner; G. L. Cubbison; Charles H. Faulkner, Jr.; Jack Hacker; Jack A. Hamilton; William Hoeltje; Sol Horwitz; Theodore P. Kunkle; Floyd L. Nelson; C. W. Ott; Wendell F. Pond; John T. Potts, Jr.; Paul J. Quimby; Frederick H. Ray; Frederick A. Reickert; Louis P. Schwendeman; Everett Seroggie; Franklin A. Simmons; Marcello H. Soto; Howard Waugh, Jr.

A. O. Smith forms subsidiary

A. O. Smith Engineering Service Corp., has been formed by A. O. Smith Corp., Milwaukee. The new firm, to function as a wholly owned subsidiary of A. O. Smith Corp., will have headquarters at 3844 N. 3rd St., Milwaukee.

A. O. Smith Engineering will supplement engineering programs now carried on by the twelve operating divisions of the parent organization. It will also undertake long range engineering design programs in the automotive field. In addition, the new subsidiary will concentrate on product designs and manufactured facilities in many fields and industries. Its services will be available to customers and clients.

Officers of the engineering subsidiary are: D. W. Sherman, president; H. E. Wolcott, vice-president; J. R. Wallace, secretary; M. J. Vollmer, treasurer; P. D. McManus, controller.

Israeli firm to make Adamas carbide

Adamas Carbide Corp., Kenilworth, N. J., has assigned manufacture of tungsten carbide to Iscar, Ltd., Nahariya, Israel. Iscar, Ltd., is reported to be the first such tungsten carbide manufacturing facility in Israel and in the Middle East.

Under terms of this agreement, Iscar personnel will be trained at the Adamas' Kenilworth plant. Adamas will furnish necessary pressing and sintering equipment for the manufacture of tungsten carbide tips, tools, dies and wear parts. It is expected that the plant will be in full operation by spring of 1957.

UCC to build new carbon products plant

Union Carbide & Carbon Corp., New York City, plans to erect a new plant for the manufacture of fabricated carbon products. The new plant will be constructed on a tract four miles south of Lawrenceburg, Tenn. Upon completion the plant will be operated by National Carbon Co., a division of UCC.

The projected installation will have an annual productive capacity of 12,000,000 lb of carbon products. This increase in productive capacity is independent of the major expansion of electrode products, currently underway by National Carbon Co.

Ampco active despite recent blast

The recent boiler explosion reported in these pages (November, WeldWorld) has not stopped activity at Ampco Metal, Inc., Milwaukee. The explosion, which shattered a wing of the office building, killing two employees and injuring nine, caused no damage to production facilities. In a letter addressed to stockholders and employees of the company, J. D. Zaiser, president of Ampco, stated that the blast did not ruin the company's prospects for a busy 1956. He commended employees for their cooperation.

The still existing walls and steel work of the damaged wing must be razed before reconstruction but production is continuing on a current basis. The total loss was estimated by Mr. Zaiser at $200,000.

DEMONSTRATION of bonding ceramic materials to produce ceramic ashtrays at Linde Air Products Co.'s booth at recent Welderama sponsored by Peters Welding Supply Co. holds attention of Fred Peters Sr. and his wife (at right). Welderama held in the International Amphitheater in Chicago . . .

. . . was a huge success. Among displays was this of Belden welding cable which drew interested visitors. Representative of Belden Mfg. Co. explains construction of cable while . . .

Nelson Stud to expand

Nelson Stud Welding Division, Gregory Industries, Inc., Lorain, Ohio, will expand its manufacturing and engineering facilities. Construction will start immediately on a plant addition. Some 15,000 sq ft will be added to the 55,000 sq ft of the present facility in Lorain.

Crucible acquires Vacuum Metals

Crucible Steel Co. of America, Pittsburgh, has acquired the entire interests of National Research Corp., in Vacuum Metals Corp. Vacuum Metals Corp. now becomes a wholly-owned Crucible subsidiary.

Vacuum Metals Corp., a producer of high vacuum cast metals and alloys, was originally organized by National Research in 1946. Since 1954, when Crucible purchased a 50% interest, Vacuum Metals has operated as a jointly-owned company. Plant and facilities are at Syracuse, N. Y. James H. Moore will continue as general manager of Vacuum Metals, which will be operated as a Crucible division, under the direction of Walter H. Wiewel, Crucible senior vice-president.

Ampco, American Brake Shoe in new group

Ampco Metal, Inc., Milwaukee, and American Brake Shoe Co., New York City, have formed a new firm for the production of a new high-strength aluminum bronze alloy. Ampco and Brake Shoe have joined forces with J. Stone & Co. (Holdings), Ltd., London, the British firm that first developed the alloy, to establish Superston Corp., which will introduce the alloy in the United States.

To be known as "Superston 40," the alloy is claimed to have high mechanical properties and superior casting characteristics. It is reportedly unique in that it contains about 12% manganese. It is nominally composed of 75% copper, 8% aluminum, 2% nickel, 3% iron, in addition to the manganese.

Whitish gold in color, the alloy melts at 1,814F and can be readily worked. First developed by Stone & Co. for marine propeller use, the alloy can be made into welding rod for joining or hardfacing. It can also be extruded as rod, tube or more intricate configurations.

Kaiser acquires Hokin Aluminum

Kaiser Aluminum & Chemical Corp., Oakland, Calif., has purchased the Hokin Aluminum Co. extrusion plant located at Dolton, Ill. The plant will have an annual capacity of 18,000,000 lb of extruded aluminum shapes and tubing.

Titanium Metals buys new plant

Titanium Metals Corp. of America, New York City, recently acquired the Ohio River Steel Division plant at Toronto, Ohio, of The Louis Berkman Co. Titanium Metals plans to convert this mill into a facility for rolling and forging titanium. The plant has 400,000 sq ft of modern mill-type floor space, with 50 acres of adjoining property.

. . . hardfacing demonstration at Haynes Stellite Co.'s booth attracts a crowd to witness another of the many live exhibits of welding procedures.

Discuss nuclear welding at Midwest conference

Use of welding in the rapidly growing nuclear reactor field will be highlighted at the third annual Midwest Welding Conference to be held in Chicago, Jan. 30 and 31. The conference, sponsored annually by Armour Research Foundation of Illinois Institute of Technology and the American Welding Society, will be held in the chemistry building at IIT.

Three papers on reactor welding applications will be presented at the Jan. 30 session. They will include: "High temperature brazing," by Peter Patriarca, metallurgist, Oak Ridge National Laboratory; "Welded fabrication of a homogeneous reactor core and pressure vessel," F. V. Daly,

(Continued on page 92)

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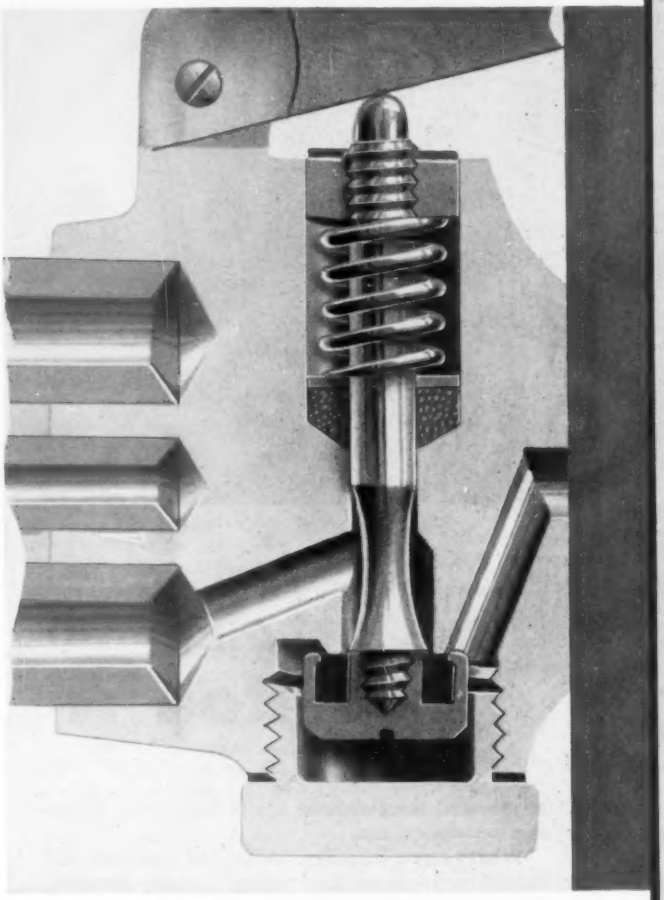

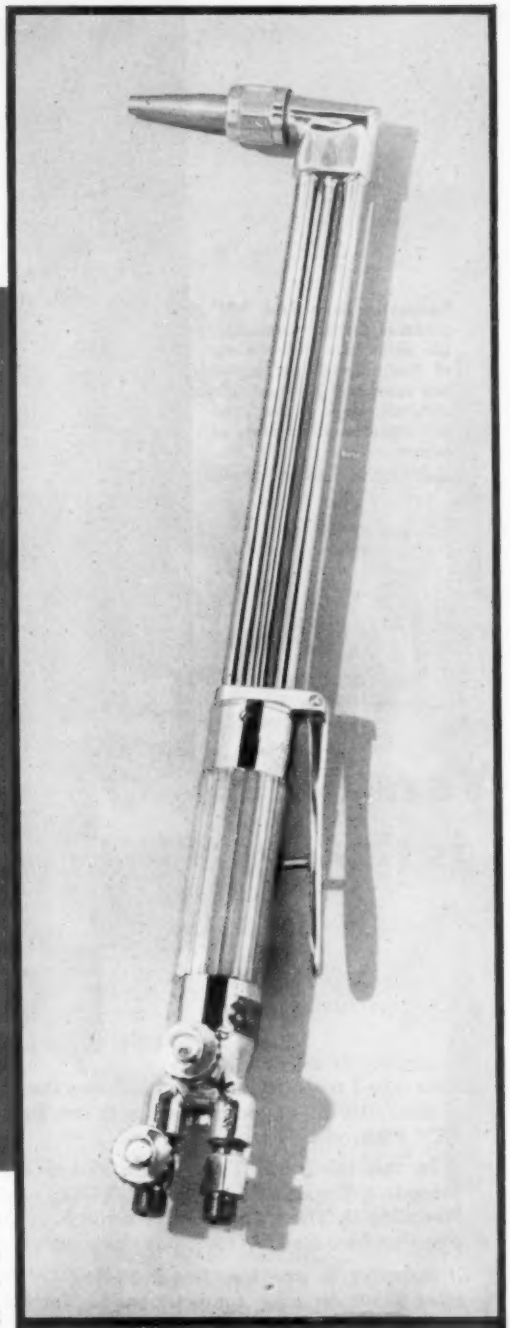

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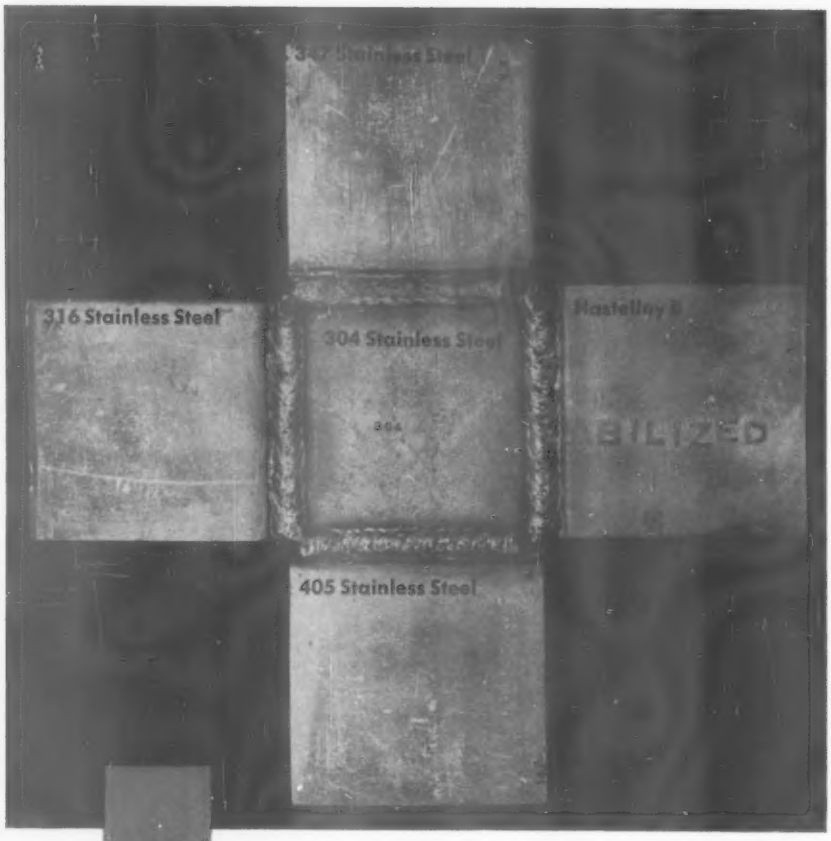

Versatile Inco-Rod "A" produces strong, sound, ductile welds in a wide variety of dissimilar alloys. In *this* test specimen it joined four different alloys to the Type 304 Stainless Steel plate at center.

Versatility is the big plus you get only with Inco-Rod "A"

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Industry is proving that Inco-Rod "A" welds *most* dissimilar alloy combinations . . . ferritic and austenitic stainless steels, low alloy steels, mild steels, high nickel alloys, and other alloys.

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What's more, Inco-Rod "A" . . . the electrode with the distinctive green flux coating . . . is *easy*-handling. Gives excellent operability in any position . . . spray type arc . . . good slag removal.

Write Inco's Mechanical Engineering Section and ask about the alloys *you* want to weld. Chances are good they can help you. New, unpublished data on Inco-Rod "A" electrode constantly coming in from the field, may provide a ready answer to your problem.

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INCO-ROD "A" electrode is supplied in 14-inch lengths in four diameters, 3/32-, 1/8-, 5/32-, and 3/16-inch (the 3/32-inch is center grip) . . . packed in 5-lb. containers.

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Letters should be addressed to: The Editor, WELDING ENGINEER, 12 E. Grand Ave., Chicago 11, Ill. No letter will be published unless signed, but your name will be withheld if requested.

Oxybutane cutting

Dear Sir:

Back in the February (1956) issue, we read an interesting article ("Comparative testing confirms oxypropane cutting value," by Jay Bland) concerning the comparisons between oxyacetylene cutting and oxypropane cutting. All the figures given and the tests run were based on using either acetylene or propane as your fuel gas.

We would be interested in knowing how butane would fit into this picture. We do not have any propane in the Philippines, but we do have butane, and we wonder whether the figures given for oxypropane cutting would be very similar to those figures one would get for oxybutane cutting.

Charles R. Butler
Philippine Acetylene Co.

—When the temperature is too low, butane does not vaporize enough; consequently there is insufficient heat at the torch. But, if the source of butane is at sufficiently high temperature to get a reasonable gas temperature and gas volume into the torch, the same conditions as those enumerated for propane should apply. Preheating characteristics of butane are superior—Btu per cu ft is 3,100, while propane's Btu per cu ft is 2,300.

Tig cutting aluminum

Dear Sir:

We refer to the article in the Sept. issue, p. 85, entitled "Tig cutting saves time in tank plant," which deals with the Tig (tungsten inert-gas) cutting of aluminum. We would be very grateful if you could let us have any available information on this subject, or recommend an American company with whom we could get in touch.

J. Burl
Newcastle upon Tyne, England

—For more information on the Tig cut-

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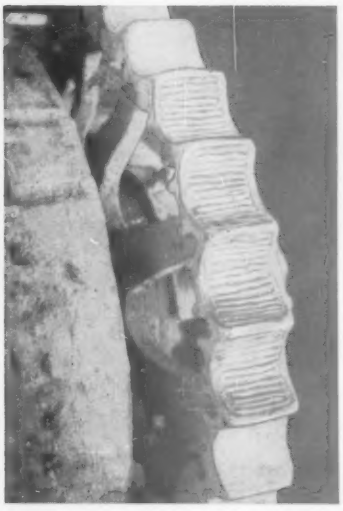

INTERMITTENT PASS used in hardsurfacing sprocket reduces rebuilding time and alleviates grinding by sand and mud.

TRACTOR IDLER shows herring-bone pattern of hardsurfacing created by intermittent pass. Grind and wear is reduced by this method.

Welder develops hardsurfacing shortcut using RANITE and intermittent pass

IN LOOKING for a more economical and quicker way to hardsurface tractor sprockets and idlers, Welding Foreman Art Powell of the L. E. Webb Construction Co., Inc., Santa Maria, Calif., hit on the idea of applying Ranite metallic coated hardsurfacing materials with an intermittent pass. In using this technique Powell lays down alternating beads with a gap between.

After trying other methods, Powell found this combination required less rebuilding time and at the same time effected a substantial dollar saving on each job.

Tractors of the Webb Construction Co. operate in both loose sand and mud with parts subject to continual heavy abrasion. When an intermittent pass is used on sprockets and idlers, resulting gaps formed between beads provide escape channels for the sand and mud, reducing grind and wear on these parts.

ART POWELL, welding foreman for L. E. Webb Construction Co., Inc., long-time Ranite user, combined Ranite with intermittent pass to reduce hardsurfacing time.

Although the Webb Construction Co. has been a Ranite user for more than two years, this is the first time Ranite was used for tractor maintenance and applied with an intermittent pass. Both Ranite "A" 3/16 and "B" 3/16 are being used for this purpose. Ranite was selected for its fast deposition rate, its resulting smooth weld bead and because it will not work harden.

Prior to shifting to Ranite, rollers were either sent out for rebuilding by automatic or were replaced with new ones. Actual savings now produced by using Ranite over automatic is $6 per roller with savings on sprockets and idlers totalling more than half previous costs. In addition, Webb Construction Co. has reduced actual hardsurfacing time by 50 per cent with the Ranite and intermittent pass combination.

Original parts used by them have a normal life expectancy of between 2000 and 3000 hours. Indications of Ranite hardsurfaced parts checked at 1000 hours of use are that the service span will be increased as much as three times.

Ranite, manufactured by Rankin Manufacturing Co., is the original metallic coated hardsurfacing rod in use throughout industry since 1938. It is made in several grades with a rod available to fit any hardsurfacing job. Toughness in proper relation to hardness is the answer to any wear problem and Ranite is alloyed on this principle with each grade being proportioned to give maximum wear for the job it is designed to do.

Cut your hardsurfacing time and costs now by shifting to Ranite. There's a Ranite rod for your particular application. For further information see your Ranite distributor or write to

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ALHAMBRA 2, CALIF.

ting process, Mr. Burl has been advised to get in touch with Linde Air Products Co., New York City, as this firm is the developer of this method for flame-cutting non-ferrous metals.

30 years ago

Dear Sir:

Was agreeably surprised when one of my coworkers came into my office the other day and showed me the excerpt in the 30-years-ago column of the October issue relative to my activities when I was employed by other companies in this industry.

Thirty years ago seems a long time but yet it was only yesterday, so to speak, in memories.

Seeing and knowing of such things means a great personal interest in the members of the industry.

Charles Steele
Steele Gases Inc.

Welding degrees

Dear Sir:

I should like to correct a statement made in the editorial comment appended to the letter from E. J. Jungst, October, 1956, p. 88, regarding schools offering degrees in welding engineering.

You should include Utah State Agricultural College, located in Logan, Utah. There is a four year program there leading to a degree and has been in existence for at least ten years. I attended this program from 1946 through 1948. I would like to add the school has a very fine curricula.

H. Dean Larsen
Fresno Junior College

Lively magazine

Dear Sir:

I must tell you how much I appreciate the WELDING ENGINEER and especially your dynamic editorials.

The WELDING ENGINEER is one of the most lively technical magazines I have ever read.

Jean Sarazin
Neuilly, Seine, France

Largest welder

Dear Sir:

I have read the October issue and find that the article, "Germany makes world's largest flash-butt welder," by John Grindrod, p. 60, is not a true statement of facts. I take exception to the statement made in the first paragraph that this flash-butt welder is capable of dealing with cross-sections up to 62 in.

I have checked our equipment so that

I am sure of the engineering data. I find that we have one flash welder that has a flash welding area of over 100 in. and about six of them have a capacity to flash weld a net cross-sectional area of 300 sq in. It appears that the world's largest flash welder is probably here in Milwaukee and a few of them in our plants in Houston, Texas.

John J. Chyle
A. O. Smith Corp.

World of welding

Dear Sir:

Congratulations on the October World of Welding issue. It was terrific and certainly an outstanding example of effective reporting for the welding industry.

If it is possible I should like to have ten copies of this issue for distribution to some of my backward friends who have not yet accepted welding at its face value.

H. E. Cable
Weld Tooling Corp.

—As requested, ten copies were forwarded to Mr. Cable.

Welded steel homes

Dear Sir:

The article in the May issue, "Do it yourself—weld a house," p. 82, describes homes being made of lightweight steel.

I will appreciate learning of steel companies supplying such steel for homes.

Granville Strunk
Lafayette, Calif.

—The names of two such firms have been forwarded to Mr. Strunk.

On paternalism

Dear Sir:

The editorial in the September issue was right to the point and stated quite clearly how many of us feel about Uncle Sam and his paternalistic ideas.

The thought of the editorial was refreshing—keep up the good work!

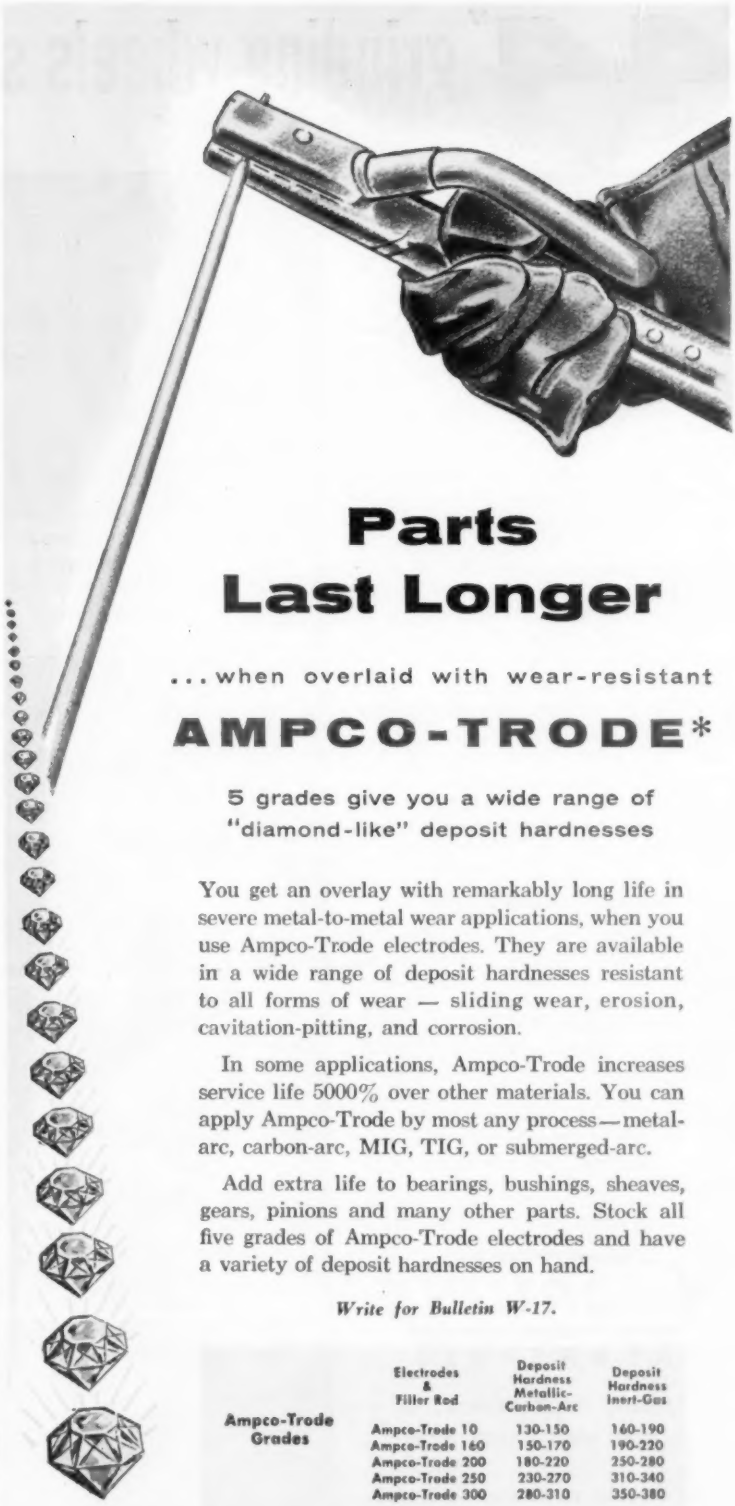
Phil Welty
Rankin Mfg. Co.

Keeping informed

Dear Sir:

I have been a weldor since 1942. I now am in the process of purchasing welding equipment and I have found WELDING ENGINEER an invaluable aid for keeping up with current happenings in the welding industry.

Robert H. Jones
Monroe, Wash.



Parts Last Longer

...when overlaid with wear-resistant

AMPCO-TRODE*

5 grades give you a wide range of "diamond-like" deposit hardnesses

You get an overlay with remarkably long life in severe metal-to-metal wear applications, when you use Ampco-Trode electrodes. They are available in a wide range of deposit hardnesses resistant to all forms of wear — sliding wear, erosion, cavitation-pitting, and corrosion.

In some applications, Ampco-Trode increases service life 5000% over other materials. You can apply Ampco-Trode by most any process—metal-arc, carbon-arc, MIG, TIG, or submerged-arc.

Add extra life to bearings, bushings, sheaves, gears, pinions and many other parts. Stock all five grades of Ampco-Trode electrodes and have a variety of deposit hardnesses on hand.

Write for Bulletin W-17.

Ampco-Trode Grades	Electrodes & Filler Rod	Deposit Hardness Metallic-Carbon-Arc	Deposit Hardness Inert-Gas
	Ampco-Trode 10	130-150	160-190
	Ampco-Trode 160	150-170	190-220
	Ampco-Trode 200	180-220	250-280
	Ampco-Trode 250	230-270	310-340
	Ampco-Trode 300	280-310	350-380

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DEPT. WE-12 • MILWAUKEE 46, WISCONSIN

THE METAL WITHOUT AN EQUAL

*Reg. U. S. Pat. Off.

W-141

"44" grinding wheels save you money.

New, non-premium ALUNDUM abrasive brings the real "TOUCH of GOLD" quality — plus — economy to your weld grinding jobs*

For a non-premium priced abrasive the performance of 44 ALUNDUM abrasive is truly outstanding.

It's a real work-horse abrasive, with extra ruggedness that can take on *more* grinding jobs — at *lower* cost. This has been job-proved in over 1100 tests made in plants throughout the country. Typical reports endorse "44" wheels for:

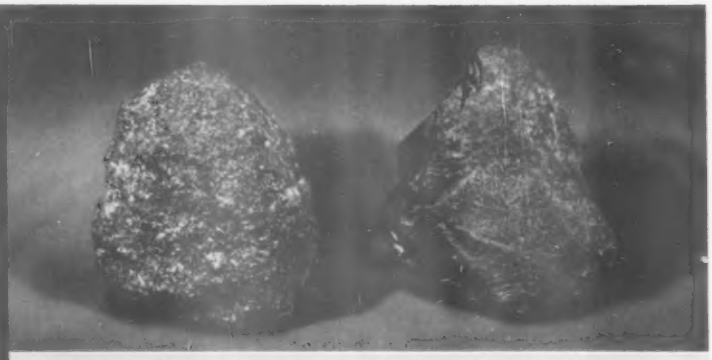
Faster cutting . . . better finish . . . longer life . . . cooler cutting . . . more jobs per wheel . . . best duplication ever received.

These are because "44" is made differently for extreme toughness and durability. To you, these "Touch of Gold" advantages mean less operator fatigue, better weld grinding and worthwhile savings.

Your Norton Distributor

can supply this outstanding new abrasive with 44 ALUNDUM wheels in the bonds, types and sizes you need for weld finishing. Or write to the nearest district office of NORTON COMPANY, Worcester 6, Mass. Distributors in all industrial areas, listed under "Grinding Wheels" in your phone book, yellow pages. Behr-Manning Company, Troy, N. Y., division of Norton Company. *Export:* Norton Behr-Manning Overseas Incorporated, Worcester 6, Massachusetts.

W-1757



HERE'S YOUR COST-CUTTING DIFFERENCE. The finer grain structure of the new 44 ALUNDUM abrasive (at right) indicates it's much denser and tougher than ordinary aluminum oxide abrasive. This means money saved every time you use 44 ALUNDUM wheels.

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ABRASIVES

Making better products... to make your products better

NORTON PRODUCTS: Abrasives • Grinding Wheels • Grinding Machines • Refractories

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*Trade-Mark Reg. U. S. Pat. Off. and Foreign Countries

DECEMBER
1956

Your *WeldWorld* at press time

Last minute news of interest to those engaged in joining and severing materials.

. . With another price rise in steel not too far away, is an electrode price hike in the offing?

. . Prominent manufacturer of head and face protection equipment will shortly introduce an aluminum hardhat which will be available to welding supply distributors.

. . The second liquid-oxygen conversion unit on a welding distributor's grounds will be installed at Morgan City, La., before the end of the year; the first was at South Bend, Ind.

. . Speaking of oxygen, a manufacturer of storage and conversion equipment will introduce a new product around welding show time (April, 1957) which it claims will eliminate the need for rail cars now used for shipping liquid oxygen, nitrogen and other gases.

. . French manufacturer of gas welding equipment has introduced a hose-to-torch coupling device that has no threads. You simply push the two ends together--a ball bearing slides over a groove in the male portion for locking.

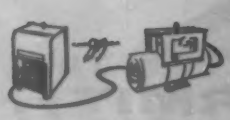
. . Tennessee Gas Transmission Co., Houston, plans to construct 1,085 miles of natural gas pipeline in Louisiana, Mississippi, Alabama, Tennessee, Kentucky, West Virginia, Pennsylvania, New York and to fields in the Gulf of Mexico off the Louisiana shore.

. . Latest improvement in planishing roll equipment makes it possible to planish straight, diagonal and circumferential seams.

. . Though American shipyards are getting busier, Japan looms as world's leading shipbuilder. With its many new facilities, Japan is going after super tankers. According to reports coming out of the Far East, Japanese shipbuilders claim they can build a 38,000-ton tanker in 179 days. This speed is attributed to the fact that the tankers are 95% welded, containing over 800,000 ft of manual welding and 116,700 ft of automatic welding . . . World's largest tanker today is the 85,500-ton Universal Leader, which has a 46-ft draft under full load. But in a couple of years, German shipyards will turn out three 100,000-ton tankers.

. . Another new safety product on the horizon: A helmet-hardhat combination that will permit a weldor to change lenses without removing the hardhat.

. . Greatly improved quick-disconnect cable connection will shortly be introduced by prominent manufacturer of arc-welding accessories. Product will not obsolete previous models and will connect with them.



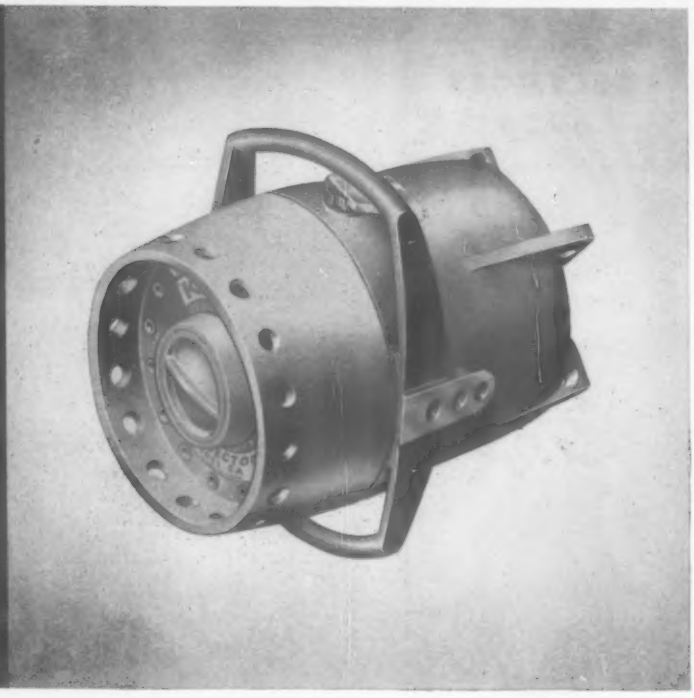
. . A boon to users of arc welding will be a simple device reported to increase cable life by 50%. Expected cost of this cable elixir: about 10 to 15 cents.

. . Business views Eisenhower's re-election as key to further expansion programs and expects continued favorable business climate.

FOR SOUND WELDS

in fabricating
equipment requiring
radiographic
inspection...

KEL-RAY® Projectors



■ No matter what the service, every weld you lay must be sound and crack-free, and able to pass rigid inspection or test. The KEL-RAY Projector is a versatile radiographic tool that is ideal for pre-service examination, for it "looks through" metal and allows you to see on film the internal structure of welds before they are okayed for service.

KEL-RAY Projectors employ radioactive cobalt, iridium or cesium as a source of gamma rays. They are made in three portable sizes, the smallest of which is less than 8" in diameter and 9⅝" long. Each is suited to specific applications. Job requirements will determine the source and specific KEL-RAY Projector. Rugged, safe, economical to own and operate, and simple to use for anyone properly trained, they are *your* means of checking work before costly damage may be done.

KEL-RAY Projectors will help safeguard the quality and soundness of your weldments. We will be glad to tell you how—just write.

WELDING SUPPLIES
RADIOGRAPHIC EQUIPMENT
PLATING MATERIALS
ORGANIC COATINGS
CERAMIC MATERIALS
TIN & TIN CHEMICALS
METALS & ALLOYS
HEAVY MELTING SCRAP

METAL & THERMIT
CORPORATION

GENERAL OFFICES: RAHWAY, NEW JERSEY

Only NEW Tubes can guarantee **"NEW TUBE PERFORMANCE"**

NEW WELDING IGNITRON TRADE-IN PLAN REDUCES MAINTENANCE COSTS

Your savings multiply with every tube you buy

TUBE TYPE	SALVAGE ALLOWANCE*	SPECIAL FEATURES
5551	$9.25	1. You always get a new Westinghouse tube
5551A	$9.25	
5552	$14.65	2. Trade-In Any brand
5552A	$14.65	
5553	$31.90	3. Trade-in any quantity
5553B	$31.90	

*Any tube acceptable except those with the following defects:
a) Dented Cylinder
b) Bent or Broken Water Connections
c) Hole Burned through Cylinder
d) Damaged Anode Headers or Cables

Offer good when worn out tubes are accompanied with new tube order of same types and in same quantity.

Why risk shutdowns! Always use a brand-new welding Ignitron . . . *not a rebuilt.* Westinghouse makes this easy. Yes, your Westinghouse Tube Distributor has the most startling, money-saving offer you've ever seen. Your old Ignitron is *now* worth more money in the Westinghouse Salvage Program.

Here's how it works! Send your Westinghouse Tube Distributor the old welding ignitron Tubes. *Check the Chart and see how much it's worth.* You'll receive a liberal credit against your order for a brand-new, never-used-before Westinghouse GUARANTEED welding Ignitron.

Trade in any tube—any make! Only Westinghouse makes this great offer . . . only Westinghouse will give a salvage allowance on any make and type of welding ignitron listed. Naturally, no *rebuilts.*

Cut new tube costs as much as $31.90 per tube! Replace all Tubes with new Westinghouse Tubes . . . and save money at the same time. Remember, only a *new* Tube can guarantee *new tube performance.*

Immediate delivery! No delay—no waiting. The Tubes are in stock . . . and the stock is complete.

Mail today to your nearest Westinghouse Tube Distributor. You'll find his name and address in your local Phone book. Or, send to Westinghouse Electric Corporation at the address given below.

I'm interested in all the facts about this amazing Ignitron "Trade-In" Salvage Plan; and why you say "I've never had it so good."

☐ Check here for a FREE survey of your Tube requirements.

Name_____ **Position**_____

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Company Address_____

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YOU CAN BE SURE...IF IT'S

Westinghouse

Electronic Tube Division, Elmira, N. Y.

6 ET-4119

Another first to help widen the scope of welding

Opens up new standards of speed and economy in welding mild steel

Here's the first all-position class 6010 electrode ever made with an iron powder coating. X-Ray and physical properties of the new Easyarc 10 are excellent. Outstanding characteristics for all-position welding with the inherent advantages of an iron powder coating. For a free sample of the new Easyarc 10, contact your nearest Airco Office.

AT THE FRONTIERS OF welding PROGRESS YOU'LL FIND . . .

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Offices and dealers in most principal cities

AIR REDUCTION SALES COMPANY

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BETWEEN PASSES

Canadians concur

Our friendly rival to the north, *Canadian Welder*, has picked up our suggestion for a foundation to raise money to further the cause of welding. (See the editorials of the April and May, 1956, issues of *Welding Engineer.)* Writing in his September column, the *Roving Welder* proposes a Canadian counterpart to our Foundation for Education in Welding . . . to be called "Welding Foundation of Canada." We wish success to the anonymous reporter from our northern neighbor.

Anent this same topic: the International Acetylene Association is distributing to secondary schools in the U. S. and Canada 40,000 copies of a booklet entitled, "More scientists through industry-education cooperation."

modern welding

Latest of the technical aids offered by the federal Small Business Administration: "Modern welding practices," by T. B. Jefferson.

facelifting job

Newport News Shipbuilding Corp. recently streamlined the *John Sergeant* by adding about 25 ft to the bow. The ship, just out of the mothball fleet, has been modernized in other ways . . . it is the first to be powered by a gas turbine engine (6,000 hp), and it has a spanking new four-bladed propeller that is 17 ft 6 in. in diameter and has controllable pitch. This modern feature allows the old Liberty ship to reverse course without reversing engines.

co-op training

Lake Forest college, north of Chicago, and Fansteel Metallurgical Corp. have instituted a program designed to train engineering technicians. These men will be used to relieve engineers of less-demanding duties. Fansteel has about 12 employees in the program. The firm pays for tuition and books and gives time off for classes. These are conducted on the campus as well as in the company's North Chicago plant. The two-year program's courses carry 44 regular college credits. These can be applied toward a degree, but none is given as part of the program. For those who want to continue in an engineering school, Fansteel will pay tuition and arrange for leave. Fansteel is parent company of WW Alloys, Inc., of Detroit.

another welding monk

When we published "The quiet weldors of New Melleray abbey" (Sept., 1956, p. 33), we thought this monastery outside of Dubuque, Iowa, was unique in being so abreast of welding's advantages. But we were wrong. Our circulation department tells us of another monk who subscribes to *Welding Engineer*. He is Brother Placid of St. Joseph's abbey at Spencer, Mass. And we will bet our bottom dollar that he and his welding crew are as adept at their tasks as are Brother Matthias and the six other weldors at New Melleray.

position for production

That headline is also the title of a full-color, 35 mm sound-slide film prepared by Worthington Corp. The 16½-minute movie covers the ABC's of welding positioners and offers application information on eliminating slow production, high labor costs, accident hazards and poor weld quality. It's available on a rental basis.

oh! to be in Paris

In computing the official cost-of-living index for France, government statisticians there have added to the list of staples cognac, aperitifs, chickens, motor-scooters and beer. What, no pretzels?

fitting salute

Recent publication of the Copper & Brass Research Association gave VIP treatment to Dockson Corp., Detroit . . . told how the firm employs brass forgings in manufacture of its gas welding and cutting torches.

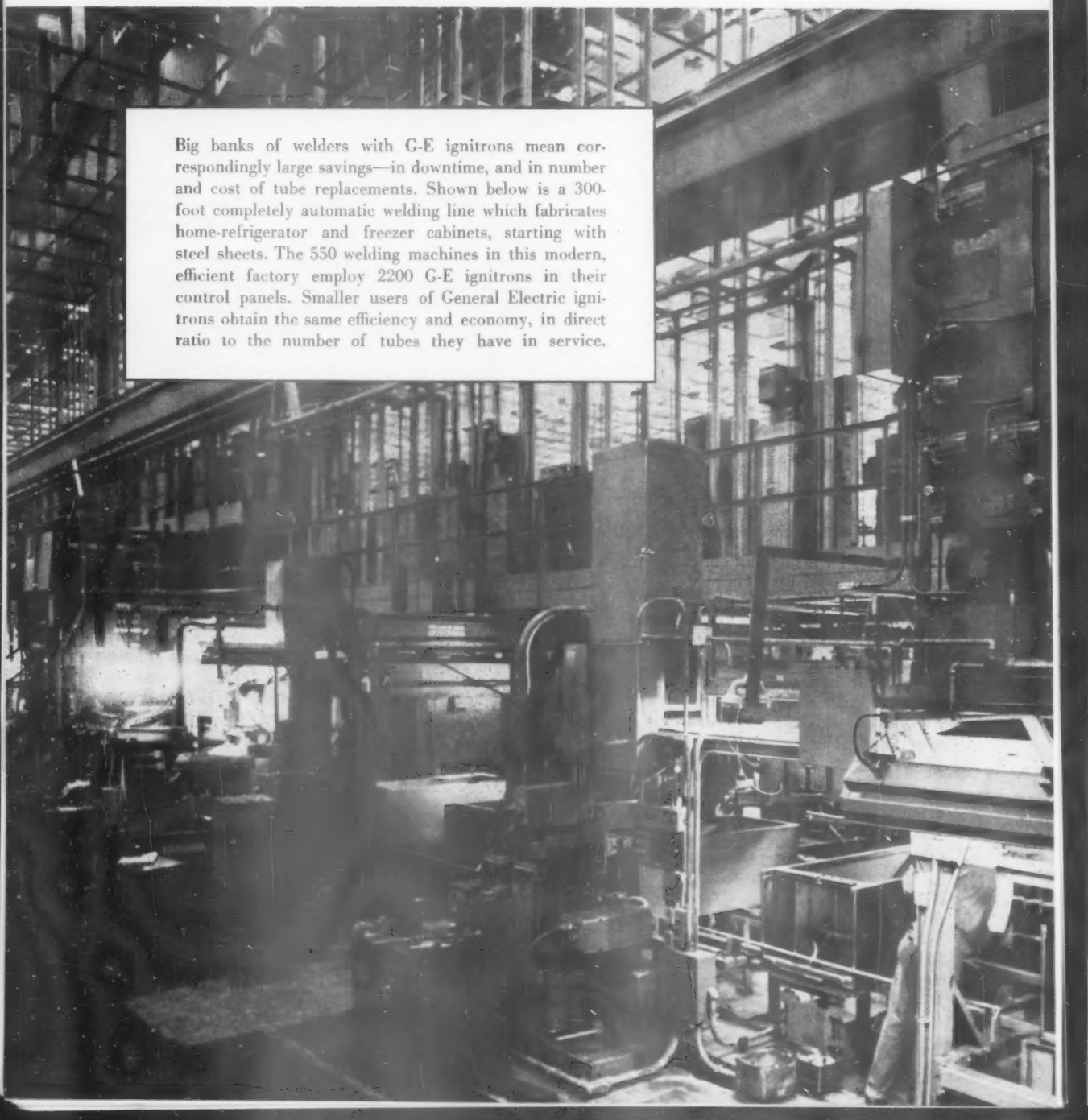
on the atomic front

Motor arc welding is a new process for fabricating atomic power plant equipment which was described at the Cleveland AWS meeting by C. C. Stone and R. A. Noland. Both men are from Argonne National Laboratory, Lemont, Ill. Operating in a closed chamber, the method employs a point arc which is moved around a closed path between parallel arcing surfaces by means of an auxiliary magnetic field. An electrode shaped to conform with weld geometry is used.

who's a tippy-dazzlem?

"Whif! See the columns, as they roll away and bring to view his bumps of self esteem! Poor Bobby, how changed from a right down, plain, honest plough-jogger to a tippy-dazzlem-fogo-cumbustibus." Any modern-day cigar smoker worth his salt would rear up on his hind legs and lick the man who called him a "fogo-cumbustibus." But this portrait of a rural smoker was written in 1836 and probably roused no feelings stronger than an urge to laugh. It appeared in an early edition of *The Old Farmer's Almanac*, and came to our attention in a circular promoting the 1956-57 edition.

YOUR SAVINGS MATCH THE SIZE WITH GENERAL ELECTRIC'S NEW



Big banks of welders with G-E ignitrons mean correspondingly large savings—in downtime, and in number and cost of tube replacements. Shown below is a 300-foot completely automatic welding line which fabricates home-refrigerator and freezer cabinets, starting with steel sheets. The 550 welding machines in this modern, efficient factory employ 2200 G-E ignitrons in their control panels. Smaller users of General Electric ignitrons obtain the same efficiency and economy, in direct ratio to the number of tubes they have in service.

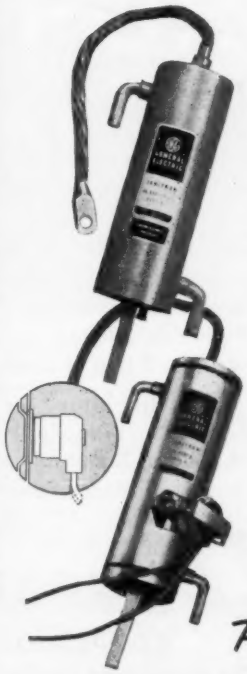
OF YOUR WELDER INSTALLATION AND REMANUFACTURED IGNITRONS!

CUT downtime and tube replacement costs! Select your welding ignitron replacements from General Electric's complete line of dependable, long-life tubes! Four different types—each designed to answer a specific welding need—can be obtained from one convenient source, your local General Electric Tube Distributor.

Every G-E ignitron means dollars saved, no matter what the size of your plant. Reliability, trouble-free operation—these qualities slash expensive work stoppages . . . help keep your production lines moving.

Also . . . save 28% on tube replacement costs! Turn in your inoperative G-E ignitrons—if in exchangeable condition—for remanufactured tubes on a one-for-one basis. Get rebuilt G-E tubes with new-tube life and dependability . . . backed by a new-tube warranty. Yet pay up to $63 *less* for each unit you exchange.

To estimate the actual dollar savings G-E ignitrons can bring *you* this coming year, see your local G-E Tube Distributor! *Electronic Components Division, General Electric Company, Schenectady 5, New York.*

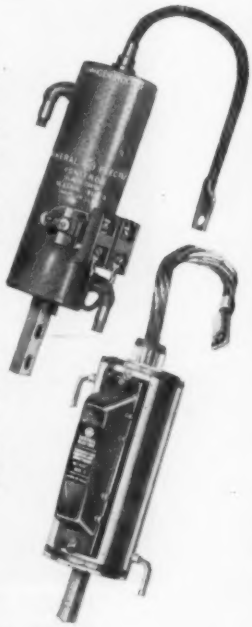


G-E Remanufactured Ignitrons get complete new cathode assembly. They give new-tube performance; are backed by standard G-E warranty. Cost $17.90 to $63 less than new ignitrons . . . almost a one-third saving.

G-E Convertible Ignitron has built-in thermal contact bracket to carry a thermostat, for over-temperature protection or water regulation. Either flying-lead or terminal-block thermostat supplied.

General Electric Plastic-coated Convertible Ignitron has a safety plastic covering to shield workers from hazardous voltages. Plastic is red for warning. "Danger . . . voltage" is stamped on. Tube condensation minimized.

G-E Temperature-controlled Ignitron is the finest tube of its kind. Over-temperature control . . . water regulation . . . both are built in. The tube is pre-adjusted at the factory for lifelong efficiency of operation.



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GENERAL ELECTRIC

161-1CS

STAINLESS STEEL WELDING WIRE...

Spooled... layer wound to assure a smooth, even feed. Sizes: .035", .045", 1/16", 5/64" and 3/32" diameters.

Coiled... layer wound on rims for submerged arc welding. Sizes: 1/16", 5/64", 3/32", 1/8", 5/32", 3/16" and 1/4" diameters.

Cut Lengths... straightened and cut wire furnished in 36" lengths for inert arc and gas welding.

Sizes: .035", .045", 1/16", 5/64", 3/32", 1/8", 5/32", 3/16" and 1/4" diameters.

Two factors give

Drawalloy

CORPORATION

WELDING WIRE

best on-the-job performance

WEAR-O-MATIC HARD-FACING WIRE...

Coiled... precision drawn for perfect roundness to insure continuous, smooth feed with any automatic head. Available in six Types for hard-facing applications.

Drawalloy welding wire is a product of two factors—years of experience in the welding industry combined with the best wire mill drawing practices. The result is clean welding wire with the proper finish, temper, diameter tolerance and chemical analysis. It's a wire that produces the highest quality welds continuously—with an easy, sure feed and a constant, smooth arc.

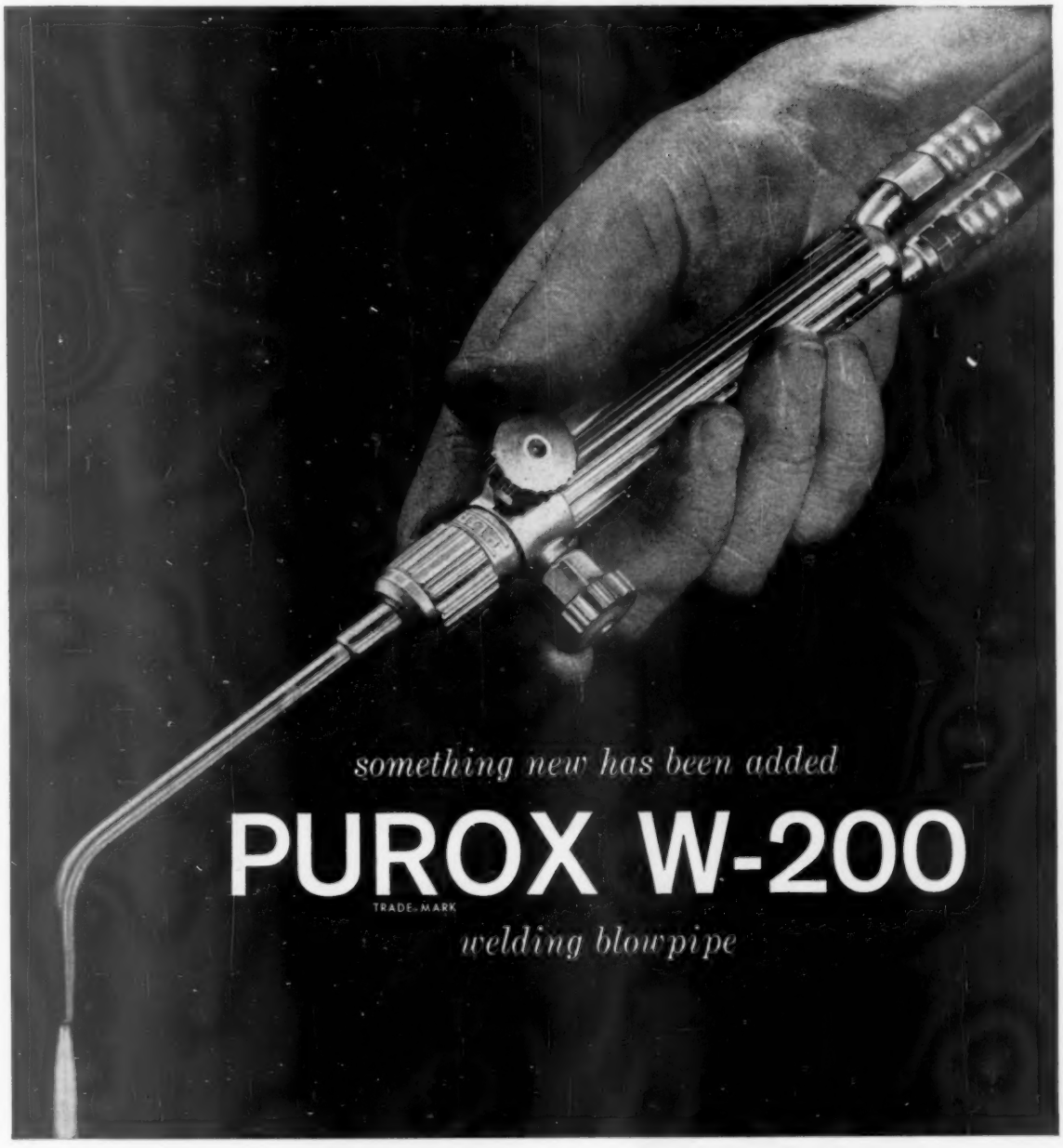
See your distributor or write Drawalloy Corporation, Lincoln Highway at Alloy Street, York 12, Pennsylvania

Drawalloy

CORPORATION

The Wire Mill For The Welding Industry

YORK, PENNSYLVANIA



A flick of the wrist slips this eight-ounce blowpipe into corners, around jigs and fixtures or into any other hard-to-reach spot with ease. Small and handy, the PUROX W-200 Welding Blowpipe combines operating comfort with results that bring all types of light welding work up to the most modern standards.

Everything about this blowpipe has been designed to eliminate excess motion and to help cut down operator fatigue. Forward valves, for example, permit instant flame adjustment with the same hand used to hold the blowpipe. Snap-in heads with "O" rings connect simply and seal gas-tight without a wrench. They can be rotated on the blowpipe handle without shutting off the flame. Heads in nine sizes give a complete welding range from 32 ga. to ⅜ in. thick.

See your LINDE Jobber

or write: LINDE AIR PRODUCTS COMPANY
Unit of Union Carbide and Carbon Corporation
30 East 42nd Street, New York 17, N. Y.

The terms "Linde" and "Purox" are registered trademarks of Union Carbide and Carbon Corporation.

When one welder IDEALARC . . .

Has the smoothest, steadiest arc AC and DC . . .

Yet costs less to buy and operate . . .

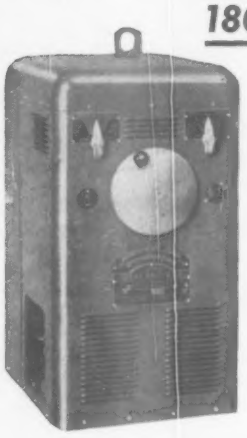
WHY use anything but IDEALARC for shop welding

now!

COMPLETE LINE

AC and AC/DC Arc Welders

180 amp to 500 amp



300, 400, 500, amp sizes.
Heavy-duty industrial models for production and fabrication with AC or DC welding current. Full 300, 400, 500 amp DC ratings. Write for Bulletin SB-1343.

180, 250 amp sizes.
DC as well as AC welding for the shop with only single phase current. Ideal for production and maintenance. Write for Bulletin SB-1364.

Select the size you want from LINCOLN'S line of IDEALARCS

- Both AC and DC are needed . . . for highest speed . . . for lowest welding cost.
- One welding machine . . . IDEALARC . . . gives you both AC and DC . . . and costs no more.
- You can buy Idealarc as a straight AC welder to which you can add DC at any time.

THE LINCOLN ELECTRIC COMPANY

Dept. 1722, Cleveland 17, Ohio

The World's Largest Manufacturer of Arc Welding Equipment

DECEMBER, 1956

Welding Engineer

ESTABLISHED 1916

Where are today's pioneers?

AT A UNIVERSITY graduation exercise last Spring, a guest speaker asked students this question—"Will you be a pioneer or routine-eer?"

An excellent question for those starting to earn a livelihood, we thought. And after further consideration, we realized it is an equally good question for those who have been at this business of earning a living for many years.

The word *pioneer* prompts visions, for most of us, of rugged individuals tramping westward beside a prairie schooner. Some of these early Americans died along the way; others more hardy survived to carve out some important spots in this wonderful country of ours.

These pioneers crossed our land 75 or 100 years ago. In welding, however, we don't have to go back so many years to find pioneers. In 1916, when WELDING ENGINEER was founded, almost everyone connected with welding was a pioneer. Fortunately for us today, many of them were rugged individuals, too. They had to be to withstand the many attacks on welding down through the years.

From 1916 to 1940, there may have been a lot of prima donnas in the welding business, but there certainly were no routine-eers. We remember some of the problems that confronted our welding crew during the last decade of this period.

THE JOB we had in pioneering the coated electrode, for instance. It was difficult to convince some of those hardheaded prima donnas—they called themselves weldors—that the "candy stick" electrode they were using would produce better results than a bare wire had ever turned out.

And along with the pioneers came the experts. Fortunately for welding, most of them were far away and the mails were extremely slow. As a consequence, before a reply to our letter told us a job couldn't be done, we had become impatient and welded it up. Some problems, of course, couldn't be overcome. But in most instances, we viewed the impossible as nothing more than just another difficult job, and we found a way of doing it.

After studying the best advice experts could give us down through those pioneering years, we reached the inescapable conclusion that most major welding advances have come about because "some darn fool didn't know it couldn't be welded and welded it anyway."

EXPERTS with their extreme caution live on, but the pioneering spirit in welding (and in many other fields) has been curtailed. The reasons for this? . . . there are several. Rugged individuals are punch drunk from beating their heads against stone walls. Americans have grown fat and complacent.

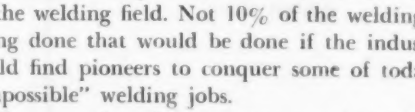
It is easier, we gather, to be a routine-eer and follow the crowd. You might not make as much headway, but you don't get as many headaches, either. This is the attitude we see and hear, and it is precisely this type of thinking that will hinder welding's growth in every field of metal fabrication.

Progress is marked by advances. If the pioneering spirit isn't there to pull a program ahead, that program will fail!

Someone may tell you a job is routine, but they are wrong. *Nothing is routine.* In this world you are always going someplace, and if you aren't moving ahead, you're slipping backwards. It's happening today to those complacent ones who stand on the sidelines when they should be pioneering new welding efforts.

Advances—many of them—are still to be made in the welding field. Not 10% of the welding is being done that would be done if the industry could find pioneers to conquer some of today's "impossible" welding jobs.

The mere fact that someone says it can't be welded should be an encouragement—a challenge—to go out and show them that *it can be done!*



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Steadier Voltage

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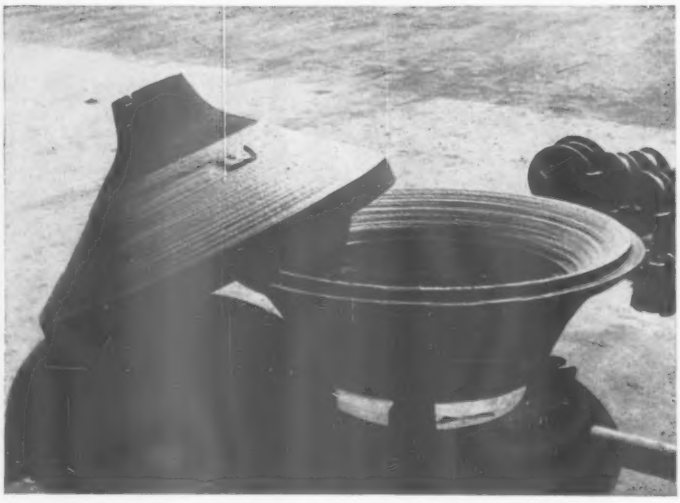
33

VICTOR EQUIPMENT COMPANY

ALLOY ROD AND METAL DIVISION

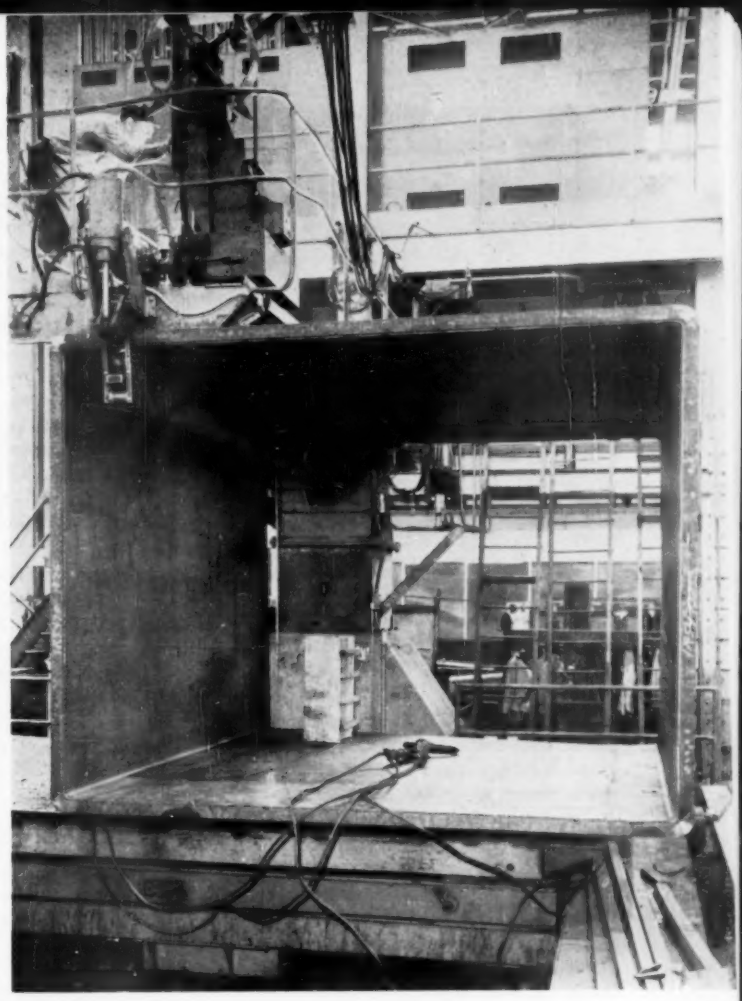
Los Angeles 59, California • Wakita, Oklahoma



Note even deposit of Victor VA#3 automatic rod on gyratory crusher cones.

TYPE	USES	PROPERTIES AND APPLICATION
VA#1	Crusher Rolls Gyratory Crushers Crusher Mantels Scraper Blades	Rockwell 'C' 54-57 Impact Resistance—good Abrasion Resistance—high AC-DC submerged arc or DC open arc
VA#2	Pinch Rolls Tractor Idlers Tool Joints Coiler Rolls	Rockwell 'C' 50-52 Impact Resistance—good Abrasion Resistance—good Submerged arc only Suitable for multiple passes
VA#3	Roll Crushers Gyratory Crushers Impellors Mill Guides	Rockwell 'C' 54-57 Impact Resistance—good Abrasion Resistance—high For use where abrasion is severe Submerged arc only
VA#4	Tractor Rollers Sheave Wheels Tractor Idlers	Rockwell 'C' 25-28 Impact Resistance—excellent Abrasion Resistance—good Submerged arc only Suitable for multiple passes Machineable
VA#5	Tractor Rollers Sheave Wheels Tractor Idlers Grader Blades	Rockwell 'C' 34-38 Impact Resistance—high Abrasion Resistance—good Suitable for multiple passes Submerged arc only
VA#6	Crane Wheels Roll Necks Pump Sleeves	Rockwell 'C' 38-41 Impact Resistance—high Abrasion Resistance—fair Suitable for multiple passes Deposit machineable Submerged arc only
VA#7	Excellent base for high alloy application. Mine Car Wheels	Rockwell 'C' 36-42 Impact Resistance—excellent Abrasion Resistance—good Suitable for multiple passes Deposit machineable Submerged arc only
VA#8	Tool Joints Grader Blades Scraper Blades Roll Crushers	Rockwell 'C' 51-54 Impact Resistance—high Abrasion Resistance—high Submerged arc only
VT#60	Tool Joints Grader Blades Scraper Blades	Automatic Tungsten carbide wire Abrasion Resistance—excellent (maximum) Deposits are heterogeneous Open arc—DC reverse only

Rod diameters 1/8", 5/32" and 3/16". Standard coil size, 22-1/2" inside diameter, 4" wide, approximate weight 100 lbs.



RIDING on boom 12 ft above floor submerged-arc welder joins plates up to ½ in. thick and 16 ft long for transformer tanks. Elevator lifts workpiece to welding head and provides lateral movement.

LARGEST of three radiator types, unit above will have 30 fins when completed. Oxyacetylene welding process is used (below) to join fins to headers. Filler metal is minimal.

Westinghouse welds oil- and gas-tight transformer cases

By F. T. Tancula

LIQUID-FILLED power transformers are encased in steel tanks that must be absolutely tight to prevent oil leakage and to permit treatment under full vacuum.

For such oil- and gas-tight seams, it is only natural that transformer manufacturers would turn to welding. The transformer division of Westinghouse Electric Corp. at Sharon, Pa., utilizes many welding processes.

Tanks for power transformers are fabricated by means of manual arc and automatic submerged-arc methods, while smaller distribution transformer cases are joined largely by resistance welding.

Plate thicknesses of power transformer tanks range from 3/16 to ½-in. SAE 1010 steel. Because of its non-magnetic properties, some 14% manganese steel is used to prevent heating around high-current-carrying bushings. All tanks are rectangular in shape and are reinforced with external channel braces.

Submerged-Arc Welded

These formed channels are also ¼ to ½ in. thick, and are joined to tank walls on a specially designed pedestal-type automatic submerged-arc welder. The bead is a ¼-in. fillet, laid in a single pass. Welding wire is 5/32-in. mild steel, and normal current settings on the a-c transformer power source range from 600 to 850 amp. Welding speed is 22 to 26 in. per minute.

The submerged-arc welder used to join tank plates rides on a boom 12 ft above the floor of the fabricating shop. The workpiece is brought under it and over a copper back-up bar by an elevator that also has lateral movement, enabling it to glide the work under the welding head and over the bar.

This welding set-up can accommodate plate up to ½ in. thick and 16 ft long. The tank brace welder mentioned above can weld a continuous seam up to 20 ft long on material of any thickness.

Westinghouse's power transformers are made to customers' specifications, so every unit is custom built. The largest tank fabricated at Sharon is 25 ft long, 10 ft wide and 16 ft high. The tank plate welder is used primarily to join seams on such tanks.

Electrode Choices

Tack welding component plates of a tank is accomplished manually with E6020, E6013 or E6012 electrodes, usually 5/32 or 3/16 in. in diameter. These same types are used in joining other components where manual welding is called for.

When using the 6013, a-c is the power source, and it is also favored when using the 6012 and 6020 types. However, in some instances, Westinghouse uses motor-generator or rectifier welders. Amperage ranges from 190 to 240 on manual applications.

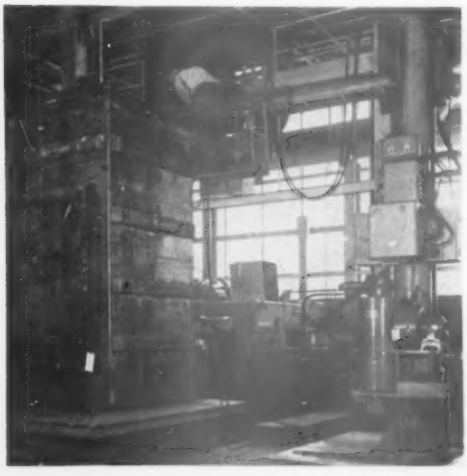
Some experimental welding with E6027 iron-powder electrodes has been conducted. But at this writing, they were not being used in the production process.

When aligning plates for tacking prior to finishing welding, the shop uses wedges and "dogs" which are knocked off after tacking is completed. Overhead cranes move the tacked assembly to the submerged-arc station.

In tacking, the weldors leave a gap of ⅛ in. between plate edges to attain full penetration. This longitudinal seam is then welded by the automatic set-up. For the most part, all such seams (and fillets on strengthening members) are welded in one pass.

Seams are welded at speeds of 15 to 22 ipm, with 3/16-in. mild-steel wire at 600 to 850 amp. Tank walls are welded to bottom plate on the smaller submerged-arc machine. Here a 5/32-in. wire is used at 700 amp, with welding speeds ranging from 12 to 18 ipm.

PLATES ¼ to ½-in. thick are aligned and tack welded before finish welding by submerged-arc process. Weldor tacks with E6012 electrode, leaving ⅛-in. gap between plate edges for greater penetration.



FORMED reinforcing channels are welded to transformer tank walls by submerged-arc unit. Single-pass weld is made with 5/32-in. mild steel wire. Welder can join continuous seam up to 20 ft long.

Cylindrical Weldments

Some cylindrical members of the tank assembly—pump housings and bushing bosses, for example—are also welded on the smaller submerged-arc welder.

Physical properties of the welds are identical to those of electrodes and welding wire.

Another major weldment on the Westinghouse power transformer is the radiator fin assembly or cooling-tube assembly. The former is used on larger transformers and is more efficient because of its larger surface area, but the latter is less expensive. Again, the customer dictates the type—usually depending upon service requirements of the unit.

Seam Welded Sheets

Radiators come in three sizes—12, 23 and 30-fin units. In manufacturing radiator elements, resistance, gas and arc welding all play important roles. Material is 0.057-in.-thick SAE 1010 cold-rolled steel.

After degreasing, two sheets, each 11⅜-in. wide, are resistance seam welded at four points—along each outer length and along a line about 3½-in. in from each edge.

After punching a small separation between sheets at one end, air at 150 psi is used to inflate the fin, giving it passages in which cooling oil will later circulate. Each end is then formed and cut to prepare it for joining to the headers.

Of much heavier material, these headers have been manually arc welded. Radiator fins are joined by the oxyacetylene process to the headers in a special rotatable positioning device. Filler metal (a mild-carbon wire) is held to a minimum. Oxygen pressure is 20 psi; acetylene is 5 psi.

When welding is completed, the positioner enables the header and fin assembly to be lowered into water deep enough to allow an air test at 30 psi. Each end of the header-fin assembly is tested in this manner.

Another test follows immediately. An excess-acetylene flame is used to carbon-black the welded joints, and oil at 176 F and 50 psi is circulated through the radiator for one hour. Slick areas denote any leaks, which are immediately repaired.

After degreasing, the radiator is given an iron phosphate coating. Three coats of paint complete the production cycle on this type of cooling assembly.

Arc Welded Tubes

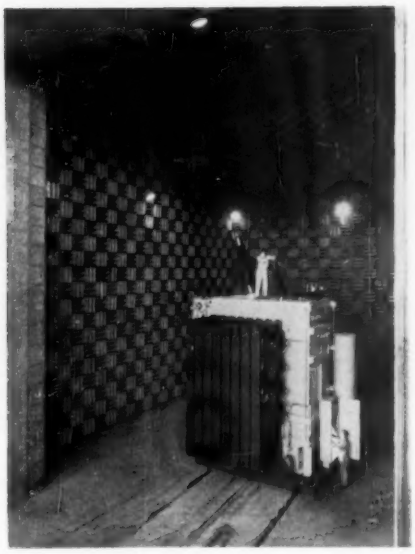
The cooling-tube unit's header and vertical elements are purchased in tube form and cut to desired lengths in the Sharon plant. Header tubes are closed at one end by a spinning and forging operation after being brought to red heat in an induction furnace.

Vertical tubes for the coolers are swaged at the ends. Wall thickness of these tubes is 0.063 in., except at swaged ends, where it is 0.093 in. Unlike radiator fins, these tubes are joined to the header by arc welding.

Westinghouse here specifies a ⅛-in.-diameter E6012 electrode. Power source is a motor-generator welder, and amperage for this application is 130. A simple air-soap purge is used to test for leaks.

The enormity of the transformer division's welding activities are indicated by this one statistic: monthly consumption of E6020 electrodes alone is 15,000 lb. Total electrode consumption is 65,000 lb per month.

Welded vault KO's echoes



SHARON, PA., is the site of Westinghouse Electric Corp.'s transformer division, which has been undergoing a three-year expansion program. Completion of this $13,000,000 project has increased productive capacity for power transformers more than 30%.

A new steel fabrication shop, 200,000 sq ft in area, is of primary interest to readers of WELDING ENGINEER, for it is here that activities described in the accompanying article take place. The room pictured above, however, is also, in a sense, a product of welding and soldering.

L. B. Rademacher, supervisor of power transformer test engineering, gave WELDING ENGINEER same data on the new anechoic *(without echo)* vault, a huge noise-testing room 70 ft long, 56 ft wide and 57 ft high.

To Reduce Noise

The vault, part of a new test center, permits complete sound measurements on giant transformers—some weighing more than 400 tons and rated beyond 500,000 kva. It will also enable Westinghouse to search for means whereby vibration and noise can be reduced.

To test transformers properly, noise level inside the vault must be reduced to 30 decibels, a sound level said to compare with that of a quiet suburban residence. Situated in the midst of the test center, the vault really needs insulation, since it is necessary to shout at close range to be understood.

The room has walls nearly 5 ft thick. Each wall contains 12 in. of reinforced concrete, a layer of galvanized sheet steel, a 2-in. blanket of glass fiber in a 9-in. air space, and 3-ft-thick glass fiber wedges on the inner surface.

The floor slab is 4 ft thick, weighs about 1,200 tons, and is supported on concrete piles.

To shield the room for radio influence tests, galvanized sheet steel, in 3 by 10-ft sections, is fastened to the inner surface of the 1-ft-thick concrete walls with split masonry nails—2 per sheet.

Eliminate Vertical Seams

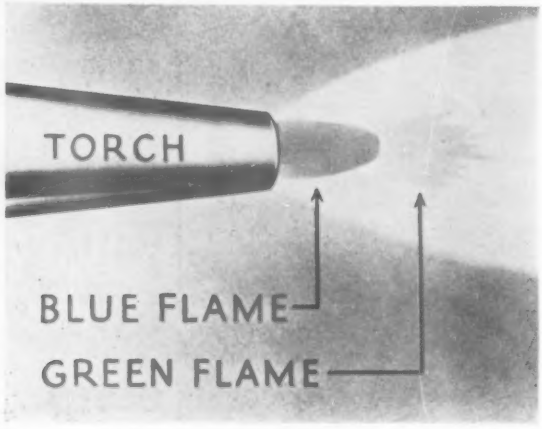
Each nail head is welded to the 22-gage galvanized sheet to diminish any possible antenna effects the nails might otherwise produce.

Sheets are mounted on walls in a staggered pattern to eliminate any long, continuous vertical seams whose physical dimensions might approximate an electrical wave length at lower frequencies where magnetic fields predominate.

To gain shielding continuity between adjacent sheets, all horizontal and vertical pipelock seams are welded along their entire lengths.

Roofing, of 16-gage galvanized iron deck material (corrugated or fluted in cross-section), is also welded at all mating seams. The steel floor lies between two layers of concrete.

DOUBLE-TIPPED torches are useful for silver brazing joints on small-diameter tubing. Dual flame distributes heat uniformly.



NEUTRAL or reducing flame prolongs flux activity. Greenish "feather" at tip of inner cone indicates a slightly reducing flame.

These 6 steps are the secret to good silver-brazed joints

SIX BASIC steps are almost ritual in good silver brazing. Although these precautions, suggested by Handy & Harman, may appear to require extra effort, in the long run they save time and money.

By producing strong, leak-tight joints of consistent quality, these steps make it possible to realize the inherent versatility and economy of low-temperature brazing.

Although compiled primarily for manual torch heating, most of the steps apply generally to all silver brazing, regardless of heating method.

Step 1: Good Fit and Proper Clearance

The joint will be strongest when clearance between parts (at brazing temperature in the case of dissimilar metals) is between 0.0015 and 0.004 in. Too little clearance limits the amount of alloy that can flow into a joint, thus producing a weak bond and sometimes causing voids.

Too much clearance may cause uneven alloy distribution, as well as voids, by reducing capillary attraction between joint faces and molten alloy. It also wastes alloy.

Step 2: Clean Metal

All surfaces to be joined must be clean and free of dirt, oxides, grease and oil. Although flux can dissolve a thin film of oil (such as may be present on mill-supplied materials), it is not designed to do heavy clean-up.

Oxides and dirt can be removed by emery cloth, steel wool, filing or grinding. For large production quantities, blast cleaning or pickling in batches may be more economical than hand cleaning.

Grease and oil should be removed with a suitable solvent, or in degreasing equipment. Parts should be cleaned reasonably close to brazing time. Once cleaned, they should be handled carefully to avoid contamination.

Step 3: Proper Fluxing

Except for a few specialized operations (such as using self-fluxing silver-phosphorus brazing alloys for joining copper parts), flux is essential.

Flux does three jobs: *(1)* it protects metal from oxidation during heating; *(2)* it dissolves any oxides that may form during heating, and *(3)* it helps brazing alloy flow quickly and wet joint metals completely.

Apply enough flux to obscure underlying metal, leaving no gaps in the coating. The silver brazing alloy should be fluxed also. If flux refuses to wet some areas of the metal, the surface has not been cleaned properly.

Flux brushes on more quickly, spreads more uniformly, and produces better fluxing action if it is kept warm (about 90 to 100 F) and covered. Several types of heated flux pots are commercially available.

If flux is applied just before parts are brazed, it will not dry out and flake off, leaving metal without protection.

Step 4: Assembling and Supporting Parts

The assembly to be brazed should be fixtured to prevent parts from shifting or becoming misaligned during heating. If clamps are used for support, see that one end of the assembly is free to expand; otherwise, it may distort or buckle during heating.

The fixture should touch parts at as few points as practical. Points of contact should be out of the heat zone to avoid conducting heat away from the joint area.

Keep fixturing as simple as possible. Many assem-

blies, such as those containing tube and socket joints, are self-fixturing and need a minimum of support to stay aligned. In many cases, a simple hold-down rod pressing on the assembly's upper end will hold parts in place.

It is desirable to have slight pressure pushing parts together, particularly when brazing alloy is preplaced. Excess alloy and flux will then be forced out of the joint when they become molten. This helps parts seat more firmly and produces a stronger joint.

Step 5: Heating and Flowing the Alloy

To minimize oxide formation during heating, the torch should have a neutral or reducing flame (one slightly deficient in oxygen). The flame's tip should be somewhat bushy, rather than needle-like.

Do not heat the joint directly, but let heat soak into it by applying flame to an area around the joint. Keep the torch moving for uniform heating; a stationary flame will exhaust flux, cause excessive oxidation, and may distort thin-gage parts.

If parts being brazed are of unequal gage, the heavier section will need more heat to reach brazing temperature at the same time as the thinner member. When dissimilar metals are being brazed, the more conductive metal should receive extra heat to make up for the greater amount of heat it conducts away from the joint area.

Parts should be heated to brazing temperature as rapidly as possible (with due caution against overheating). This is done so that exposure time to the flame—which leads to oxidation—is held to a minimum.

If silver brazing alloy is preplaced, do not attempt to melt it with a torch. Let heat soaked up from the joint area do the job. If the alloy is hand fed, do not apply it until the joint has reached brazing temperature.

Flux appearance offers a good guide to temperature of the joint.

As flux heats, it gradually loses its white, opaque color. At about 1,100 F (slightly below flow temperature of a commonly-used silver brazing alloy), flux appears to be a colorless, transparent, somewhat glossy material resembling cellophane.

The silver alloy should be applied a second or two later. Temperature of the joint can be tested directly by melting the end of the brazing alloy with the torch to drop a small amount of molten alloy on the joint.

If the alloy draws up into a ball or forms a sluggish puddle, the metal has not yet reached brazing temperature and must be heated longer before alloy application.

When parts reach proper temperature, merely lay a section of alloy in the joint seam; it will melt and flow quickly into the joint like a thin liquid. If the alloy does not distribute itself evenly, that part of the joint deficient in alloy is probably not sufficiently hot.

In this case, do not apply more alloy, but move the flame with a brushing motion toward the joint's empty section. The alloy will follow the heat and complete the joint (if enough is present), even though you may be working against gravity.

Single-tip torches of multi-port design are popular for brazing relatively straight or moderately curved joints. However, for brazing tubing joints ½ in. in diameter or less, double-tip torches are helpful in producing quick and uniform heating (since the joint can be heated from two sides simultaneously).

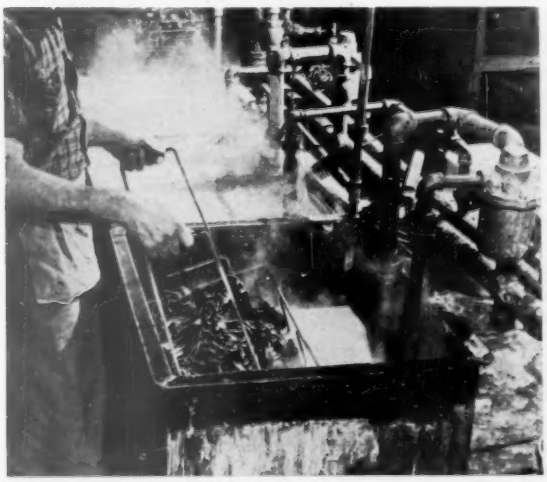
Step 6: Final Cleaning

Flux can be removed easily if the job is done immediately after brazing while the joint is still hot. Wiping the joint with a wet rag or quenching it from black heat will flake off most of the adhering flux.

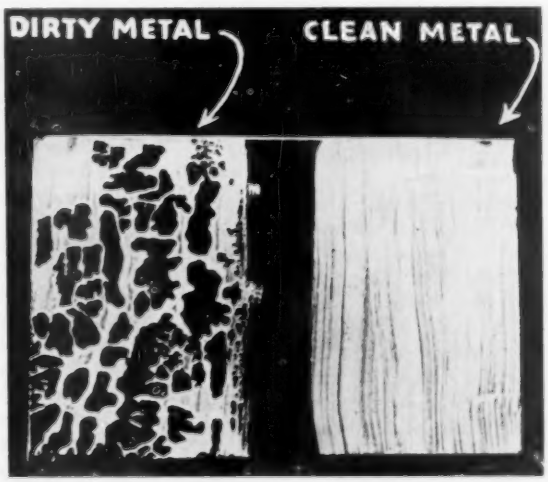
If flux has become fairly cool, hot agitated water should be used. If flux has cooled completely, brushing with a stiff brush may be necessary in addition to soaking.

Stubborn flux pockets containing hard-to-dissolve oxides can be removed in a warm pickling bath of 10% sulfuric acid. Nitric acid should *not* be used because it may attack the brazing alloy.

In practically all instances, flux can be removed during normal pickling procedures preparatory to plating.



QUENCHING parts from black heat speeds flux removal. Cooled flux can be removed more easily in a hot agitated bath containing 10% sulfuric acid.



SOLID uniform coating of flux is important. Occurrence of voids in flux coating usually indicates improper cleaning. Flux should be kept warm and covered.

METAL-SPRAY technique is used to weld cracks in water jackets of engine blocks and in cylinder heads. Three metal-spray rods are needed in this treatment.

Oxyacetylene in railway maintenance

By T. S. Bean*

THE oxyacetylene torch has rated an acceptance by the maintenance-of-way department of Southern Pacific Railroad Co. equal to that of any machine tool yet devised.

Though small in size, it becomes a Goliath among tools when mighty plates and billets feel its bite.

Southern Pacific repairs numerous items of work equipment in its maintenance-of-way shops. These items include earth-moving equipment, powered track tools, bridge and building equipment, freight-handling equipment and automotive equipment.

Controlled Speeds

The firm's large system maintenance shop in Oakland, Calif., is equipped to handle major repairs of such equipment. There, too, facilities for the design and fabrication of truck bodies, trailers, and various powered track-equipment tools is concentrated.

Structural steel plates for repairs and fabrication are cut to desired sizes by radiagraph-type flame-cutting machines. Electric motors with controlled speeds provide power for linear travel of these units, which cut vertical straight lines, bevels, arcs and circles.

For more complex material cutouts (such as hardware for truck bodies, sprockets, sprocket sections, heads for air and hydraulic cylinders, and various other parts requiring contour cutting), a portable flame-cutter especially designed to handle irregular shapes is used.

A pattern or chalk tracing is followed by the operator, who manually guides a power-driven tracing wheel. Billets up to 8 in. thick are cut with the latter machine. Cut-outs are surprisingly accurate; in many instances, no machining is necessary.

Special Spray Wires

Because of the many equipment varieties to be maintained, replacement parts are often hard to come by. To expedite repairs and effect savings, parts reclamation procedures are vital.

One of the major parts maintenance activities is metallizing with an oxyacetylene metal spray gun. Such guns use special wires fed through a central tip.

Compressed air operates a built-in motor which controls wire feed through the gun. An oxyacetylene tip surrounds the spray wire; as it is ejected from the gun, flame melts the wire into globules.

Compressed air passes through the gun tip's outer perimeter and forms an envelope around melting wire. This atomizes globules into a fine spray, and its force impinges sprayed metal against the part to be built up. The part is layer-sprayed to build the area above its original size, allowing for finish machining.

The West Coast firm metallizes parts in a specially equipped room. A 16-in. swing lathe with an 8-ft bed is shrouded throughout its length to dispel overspray by means of an exhaust vacuum system.

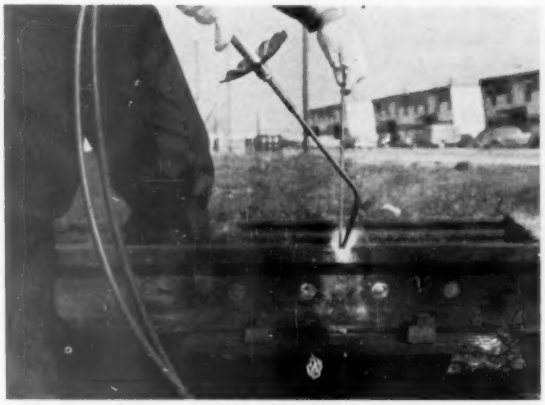
Crane Drumshafts

The lathe has offset chucks to turn and build up the throws of crankshafts; it has a special mounting on the carriage to accommodate the spray gun.

In addition to crankshafts, such items as crane drumshafts, deep well

AUTOMATIC flame-cutting unit is used for edge bevelling application.

Mr. Bean is superintendent of the System Maintenance-of-Way Shop of Southern Pacific Co., Oakland, Calif. This article is based on a paper presented by Mr. Bean before the annual convention of the International Acetylene Association.



OXYACETYLENE torch is used to butt weld rails in road crossings and station platforms where area is to be built up to track level.

AFTER welding, asbestos is packed in jig which surrounds weld area. Heated surface of rail is left exposed to atmosphere quench.

pump shafts, axleshafts from earth-moving equipment, switch controller shafts, and pistons of boiler feed water pumps are metal-sprayed.

In building up these surfaces, a spray wire of high-chrome, high-carbon stainless steel is used. When ground, it extends wear life from two to five times that of the original metal.

Southern Pacific has recently used the metal-spray technique to weld cracks in water jackets of engine blocks and in cylinder heads with considerable success. Engines welded with the process are watertight and have shown no porosity.

In metal-spraying such cracks, vee-grooves are cut throughout their length. Studs are tapped into the solid metal just beyond ends of the cracks. Three metal spray rods are required in this treatment.

Broken Castings

The first, a bonding rod, is applied to the vee with a light 0.004 to 0.006-in.-thick application. Then, 0.020 to 0.030 in. of a copper-base spray rod is applied. The vee is filled and the weld completed by layer-spraying with a steel rod containing 0.25% carbon.

Many broken castings are reclaimed by brazing. Small castings are usually preheated with an oxyacetylene torch, and cooling is controlled by covering castings with sheets of asbestos.

Large castings require specially built ovens for heat control. These parts are preheated by gas torches, and heat is controlled during welding and postheating by briquets. Machinery deck castings weighing 5 tons and more have been welded successfully in this manner.

The oxyacetylene torch is used to flame-harden stock rails of switches to increase service life. A stock rail pairs up with the switch point inside the companion rail to divert traffic from one track to another.

It is a standard-length rail bent right or left at the point of the switch. This rail's inside ball is machined for the distance a tapered switch point nestles against it in normal alignment.

These rails were once renewed frequently due to excessive wear caused by a flattening effect of *false flanges* on partly-worn car wheels.

Hardened Surface Needed

In railroader's language, the false flange is a ridge which forms on the outside edge of a wheel's running surface as it wears. The running face of a wheel is of necessity wider than the rail's head, and as wheels wear, they *cup out*, leaving outer flanges.

When wheels pass over broad areas formed at the intersection of stock rails and switch points, loads are concentrated onto false flanges. This causes a crushing and heavy flow of metal on the stock rail's head. Since switch points and stock rails must be matched, an increase in the stock rail's life also saves renewal of the switch point.

To withstand such heavy damage and to extend stock rail service life, a hardened surface in this area of the stock rail was needed. It was important, however, that hardness penetration should not be deep enough to cause brittleness.

Stock rails were first hardened in November, 1950. Field tests have since shown that flame-hardening doubled their life. Procedures adopted six years ago are similar to those now followed.

The rail is first planed for right or left-turn usage. The area to be flame-hardened is buffed to remove mill scale. The rail is then clamped, with base down, onto the bed of a 25-ft table.

Crane Handles Rail

It is pre-stressed to compensate for distortion due to heat application. Point of greatest stress is placed at the table's center. The rail is graduated down to the table level at each end through bearing points set at 4-ft ordinances.

The rail is handled by an overhead bridge crane which sets one end into hold-down clamps. It is jacked and clamped to the table on its opposite end with the base bearing against stress points throughout the table's length.

A heating torch with a 3-in. water-cooled tip is mounted to a 90-deg torch arm extension. An air quench box is attached behind the torch to the extension arm. The arm, in turn, is clamped to the adjusting arm of an automatic flame-cutting machine which travels parallel to the rail on drive wheels recessed into a special track.

This track is set on the same radius as the rail surface to maintain proper flame distance. The bottom front edge of the quench box has holes arranged to discharge air directly behind the flame onto the rail for

more rapid cooling.

Discharge water from the heating tip is piped through the front chamber of the quench box and then dispelled into a drain pan. In this manner, the quench box is set to trail the tip as close as possible.

Regulated Gas Flow

Flow of oxygen and acetylene gases, compressed air, and water is regulated from a central fixed point near the operator. Supply hoses are trailed from a free-swinging arm to the machine.

Oxygen pressure is set at 22 psi, acetylene at 13 psi, and compressed air at 90 psi through a ½-in. supply line. The rail is heated to approximately 1,600 F, and is air-quenched to approximately 500 F.

A neutral flame is maintained on the torch, and travel rate of the flame is approximately 7 in. per minute. Hardness of the rail's top surface is increased to 360 Brinell, decreasing gradually through the hardened area as the boundary line is approached.

Rail End Build-Up

Rail ends at a joint also take a continuous pounding from concentrated loads on car wheels. The wear grows along running surfaces of rails as the worn area deepens. Rail ends should be built up before this area of wear is extended.

A weldor uses a 24-in. straightedge and a gage to determine amount of wear at rail ends. If wear exceeds 3/64 in., the rail is rebuilt. All flaws such as laminations or loose metal are melted and washed out of the area to be welded.

Upon reaching a cherry-red heat (using an oxyacetylene torch) a broad layer of chrome-vanadium weld metal is deposited across the end of the rail. Successive layers are applied across the ball of the rail up to the end of the worn area. Rebuilding is completed before excess heat can penetrate the rail.

The weldor uses a hammer to peen each weld layer and plays the oxyacetylene flame freely over the welded area to maintain surface heat. He then uses a hot-cut chisel to trim off excess material.

A sledge hammer is used by a weldor's helper to smooth running surfaces and form a radius on the gage side of the rail. Powered grinders sometimes are used in place of manual flatteners.

The rail quickly cools, and weld metal work-hardens to 350 Brinell—100 points harder than the rail. The rail surface near weld metal is improved after cooling. A perceptible increase in surface hardness results.

Battered Rail Joints

Excessive maintenance on joint bars and ties can be prevented, Southern Pacific discovered, if rail ends are rebuilt while wear is still minimal.

Rebuilding of battered rail joints with the oxyacetylene process is also done. It is estimated that in 1955, 65,000 joints were welded in this manner on Southern Pacific lines, and 1,980,000 cu ft of acetylene and oxygen were consumed in the process.

Arc and gas maintenance weldors are furnished trucks on which are mounted oxyacetylene outfits for cutting operations and for any field welding of work equipment.

The oxyacetylene torch is used to butt weld rails in all road crossings, streets and station platforms where the area is to be built up to track level. Rails are butt welded before being placed into the track. They are usually leveled on blocks clear of the track area.

BROKEN castings (both small and large) are reclaimed by brazing.

Rail ends are scarfed preparatory to welding by means of a cutting torch. The rail end is first scarfed on about a 45-deg angle, starting back on the rail head about 1½ in. The web is scarfed from both sides on a lesser angle of about 30 deg to meet in the center of the web.

Web Welded First

The base is scarfed from its outer edges on the same angle toward the web, the cut being downward. After the slag is removed, rails are leveled and a ¼-in. gap is left between their ends. The weldor uses a number 9 or 10 welding tip. Chrome vanadium welding rod is used for the weld metal—the same type of rod used in rebuilding rail joints.

The web is welded first, starting from the junction with the base and welding upward to the ball. The base is then welded on each side, starting at the junction of the web and working out toward its edges.

The ball is welded last, each layer of weld metal being peened. The weld area and 5 to 6 in. back on the adjoining rail on each side of the weld are postheated to about 1,000 F with the torch.

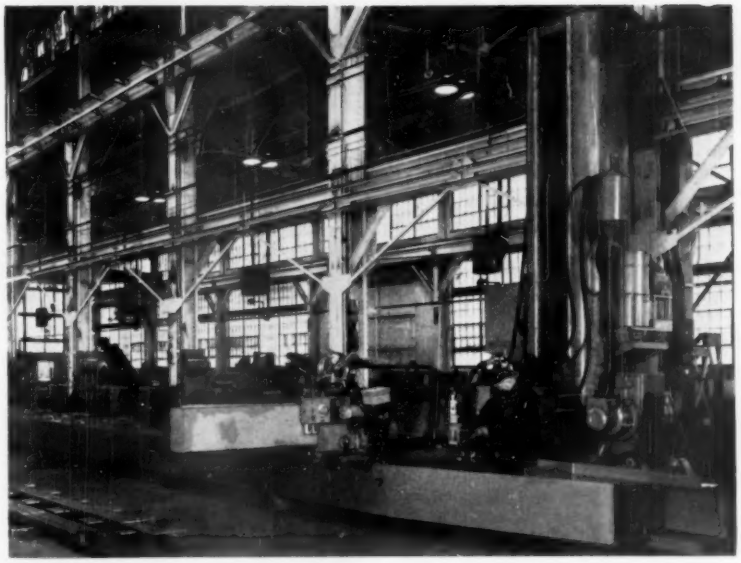
Dry ground asbestos is packed into a jig which surrounds this area. The heated surface of the rail is left exposed to atmosphere quench. After the rail is cool, the asbestos is removed and the angle bars are bolted to the rails.

Further uses are currently being sought in Southern Pacific's maintenance-of-way department for the oxyacetylene torch. Through extensive research, the firm hopes to solve many more of its welding, heating and cutting problems.

OXYACETYLENE process is used to rebuild battered rail joint. Last year, 65,000 joints were welded in this way.

once riveted, heavy-duty cranes are now the product of this

Dual-head girder welder: a star in Morgan's lineup



DUAL floating heads on this submerged-arc welder, said to be world's largest continuous welder, enable Morgan Engineering Co. to weld web members of box-frame girder to cover plates in one pass. Power sources are 900-amp, m-g, c-p welders.

By F. T. Tancula

PROGRESS can mean many things. At Morgan Engineering Co., Alliance, Ohio, it means a switch to all-welded products where only three years ago these products—heavy-duty industrial and specialty cranes—were 80% riveted and only 20% welded.

Most of the specialty cranes built by Morgan are destined for use in steel mills. These open-hearth cranes and charging machines, ingot-stripping cranes, and similar equipment are the detail-engineered result of a studied effort to give the customer a better product . . . through welding.

Manual and automatic submerged-arc welding are the primary joining processes which enable the firm to accomplish this aim. For the submerged-arc applications, power source is a constant-potential, motor-generator welder rated at 900 amp. For hand-welding operations, Morgan prefers an a-c transformer type machine.

Used Beyond Rating

Chief Welding Engineer I. W. (Bill) Evans said that the c-p welder is often used beyond the rated 900 amp, and has done each job well. Naturally, neither he nor WELDING ENGINEER recommend such practice.

Nevertheless, when the situation arises, Evans said, he is not afraid to run the machine as high as 1,750 amp and up to 52 volts. Higher voltages enable Morgan to achieve a widespread bead on a single pass in some automatic applications. Evans also said this wide bead improves fusion on both sides.

An example of modern methods of joining by manual and automatic processes can be found in girders for large industrial cranes. Weighing as much as 75 tons apiece, the girders are usually of box-frame construction, though Morgan also builds smaller ones with single webs.

Hand-Welded Plates

Depending upon size of the crane, girder webs range in plate thickness from 5/16 to ¾ in. Covers, *i.e.*, top and bottom flanges, vary from ⅝ to 2¼ in. Base metal is ASTM A-7 structural steel. Spans are from 60 to 80 ft in length, but Morgan has built them as long as 120 ft.

In a 120-ft box-frame girder, the ¾-in. web members consist of five 24 by 8-ft plate sections manually welded together. Edges are beveled 30 deg (60-deg included angle groove). The first pass is laid down with a 3/16-in. E6011 electrode and, where multiple passes are designated, a 7/32-in. E6024 is then used.

Strengthening diaphragms are placed at intervals corresponding to depth of the web members, hence on this 8-ft web they are spaced 8 ft apart. Steel bars, previously hand welded to the diaphragm plate, perform as back-up for manually welded seams joining two sections of web plate. This is true of both web members, and results in box-frame construction.

But before being joined to the

webs, diaphragms are welded to the top cover plate. Smaller diaphragms that do not extend the full depth of the webs are also welded to webs and top flange members.

External stiffening members are joined to web plates with 3-in. intermittent fillet welds on 9-in. centers. Welds are staggered on either side.

Iron-Powder Usage

The E6024 iron-powder type is used more than any other manual electrode at Morgan, and weldors employ the drag technique. The firm, however, does use some E6027 and E6014 types. (The latter, which has a 30% iron-powder coating, is not yet a recognized AWS standard.) Power source for manual arc welding at Morgan is a-c transformer, and current settings are those recommended by electrode manufacturers.

After tacking bottom flange to web members, the girder is moved to a large submerged-arc station in the weld shop. Here, two floating heads lay down a 7/16-in. fillet at either cover plate in a single pass.

Whether the girder has straight-line or fish-belly design, the heads follow joint contour for the entire length, be it 60 ft or 120 ft. This is possible because the gantry fixture, riding on a track parallel to the girder, has a boom on which the vertical and horizontal floating heads ride. Variations in height or any warpage are compensated for by the constant-potential welding power source.

Wire-feed speed will increase to keep a constant arc distance should the head move up, or decrease if it moves down. And each head is independent of the other. The electrode is 5/32-in. copper-coated, mild-steel wire. Power sources are the aforementioned 900-amp machines.

100% Stress Relief

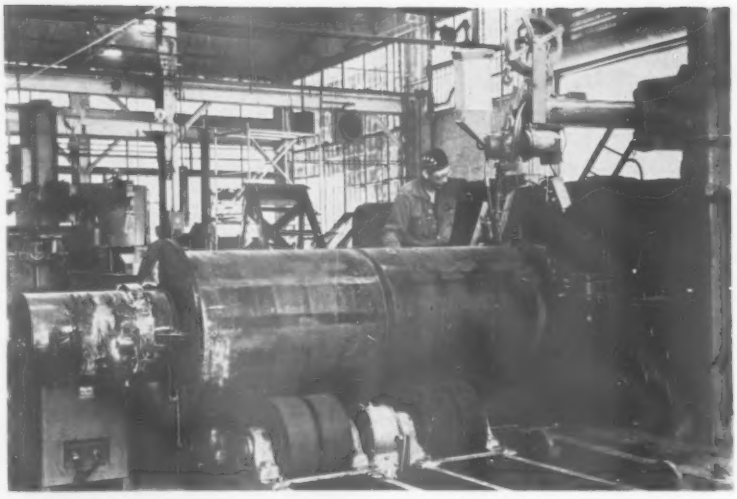
These single-pass welds are 50% stronger than the parent metal, according to Chief Welding Engineer Evans. Tensile strength is 75,000 psi; yield is 55,000 psi, and elongation is 26-28% in 2 in. Minimum penetration specified on all such girder welds is 70%.

Other examples of welded construction at Morgan are depicted in accompanying illustrations.

The area's largest stress-relief furnace is claimed by Morgan. Capacity is more than 200 tons, with the average load between 350,000 and 400,000 lb. Morgan stress-relieves all its weldments.

The furnace's dimensions are 56 by 21 by 16 ft and it consists of three zones controlled independently of each other. Two thermocouples are used per zone—one on the thickest member, one on the thinnest. If temperature difference is more than 25 deg, that zone's burners are cut off or adjusted until thermocouples show the temperature variance has been reduced to 25 deg or less.

The furnace is fired by oil and has 48 burners, but it is so efficient that only 24 have been used at one time so far, Evans said. Weldments are given a seven-hour heat at 1,150 F, plus or minus 25 deg. The entire warming and cooling cycle, however, takes anywhere from 18 to 22 hours.



DRUM which will be used for cable spool on 100-ton crane is automatically submerged-arc welded. Wire is 5/32-in., copper-coated mild steel. Power source is 900-amp, m-g, c-p welder. Morgan's weld shop often uses the two-headed gantry welder to weld drum to end plates simultaneously.

STRESS-relief furnace has capacity of more than 200 tons. Most of it was built by Morgan personnel. All weldments are treated with heat of 1,150 F for seven hours.

—Courtesy Lincoln Electric Co.

STRUCTURAL welding in Europe has produced some interesting and advanced engineering. This is a grid structure roof of the Hall of Comptoir Suisse, Lausanne, Switzerland. European welding design is superior to that in the U.S., according to the Canadian report.

How Europe can increase its welding productivity

By a Staff Member

★★ *European welding design is superior to, and in advance of, practices current in the U. S. and Canada. America* (i.e., *Canada and the U. S.) would do well to invite a team of European designers to lecture throughout the continent.*
★★ *Modern techniques used in America are known also in Europe, but are not so extensively employed.*
★★ *European productivity is lower.*

THESE were three major impressions gained by R. M. Gooderham, director of the Canadian Welding Bureau, during a visit to 11 European countries. Mr. Gooderham traveled as a member of the Organization for European Economic Cooperation's Mission 250.

Mission 250, with its express purpose of making a comparative study of welding techniques in Europe, met in Paris in April, 1955, to begin a four-week tour. Throughout this journey, the International Institute of Welding made possible many plant tours and conferences of the 29 members of the Mission.

Mr. Gooderham prefaces his report to the Welding Bureau (and its parent organization, the Canadian Standards Association) with the observation that time limitations necessarily restricted the gathering of accurate production times or production efficiency. Impressions, then, form the basis for this report.

Following up the major impressions presented at the beginning of this article, Mr. Gooderham significantly notes that European and American production problems have many similarities. Generally, however, it was found that over-all American efficiency seems higher—a factor due to more effective use of high-cost American labor.

Dividing *arc time* by *employed time* and expressing the result as a percentage is a basic step taken by Mr. Gooderham. In establishing this fundamental equation, he sets up a criterion by which he can fairly judge European welding efficiency as he saw it.

Increasing current values normally used was one of the many methods cited by the report for increasing weldor efficiency. Manual arc welding usually is performed at currents varying from 150 to 250 amp.

Downhand the Answer

Holland, for example, consumes 300,000,000 electrodes each year. Assuming that two minutes are required to melt one electrode, total annual arc time in The Netherlands could be estimated at approximately 10,000,000 man-hours.

A 10% reduction—or 1,000,000 man-hours—could be effected simply by increasing current 10%

Similar savings could be gained by avoiding the necessity for higher current values, states Mr. Gooderham. Avoiding upright fillet welds and other vertical or overhead welds would obviate the need for high currents.

Work positioners, then, would be of great value to many European welding firms presently operating without them. Their value is obviously enhanced by added reductions in weldor fatigue, in interruptions and in weld cleaning time, since fewer beads are needed for positioned downhand welding.

Good appearance—a selling point for welded fabrications—still haunts many firms and creates an added expense in weld cleaning that is unimportant. Unseen welds should receive no *special* finishing.

—Courtesy Armco, Paris

WORK positioners are recommended by Mr. Gooderham for increasing productivity. Here French plant uses turning rolls in rebuilding spun cast iron pipe mold. Manual submerged-arc welding unit is used in automatic application on pipe mold's bell end.

Operating Factor

In manual welding, a 100% operating factor (arc time divided by employed time) is difficult to achieve. Excluding fatigue allowance, however, it is possible where work objects flow continuously and contiguously past the weldor. Such a flow is possible with a conveyor.

Revolving devices could assure the next-highest operating factor, and indexing tables are third in importance in reducing time waste.

Generally, the operator should do nothing but weld . . . otherwise he is not ideally employed. Extraneous duties like handling, assembling and tacking should not be his responsibility. Cleaning or slag removal is especially to be avoided by the weldor.

Manipulators

Mr. Gooderham summarizes handling facilities in their order of benefit:

1. Conveyor systems: *a*. Overhead; *b*. floor-mounted; *c*. power-driven, and *d*. gravity.
2. Skid transfer bins.
3. Cranes: *a*. main shop cranes; *b*. secondary monorail hoists, and *c*. jib cranes (wall-mounted or post-pivoted).
4. Goose-neck, floor-mounted and propelled, breakdown-type cranes.
5. Wheel-mounted fixtures.
6. Shop transfer tables (roller-surfaced).

Closely allied to the above, but even more important, are fixtures and manipulators (positioners). Actually, a good fixture should be a manipulator, or at least mounted on such a variable positioner so as to become part of it.

The importance of such devices is stressed because the greatest loss of time in welding occurs in assembly. Primarily used to increase arc time, they are also instrumental in increasing welding speeds by positioning for downhand welding.

The Canadian report's final section is devoted to the weldor himself. Such topics as his comfort and incentive are discussed at length.

"Could you take some time off and open a vault? Our timelock isn't working."

Mr. Gooderham felt there was evidence that the European weldor was becoming satisfied with his income and way of life; his wants and those of his family were largely met by his pay.

Implementing Proposals

Realizing that reports, by themselves, will accomplish little in increased productivity, Mr. Gooderham suggested six steps for implementing the proposals designed to increase European welding productivity.

Summarized, these are:

1. That part of Mission 250's report be directed to top management, part to technical personnel.

2. That national welding organizations in Europe assign an officer to discuss the report with managements.

3. That managements be persuaded to cooperate in step No. 4.

4. That each country employ several U.S. welding technicians.

5. That these men be recruited through U.S. manufacturers of production welding equipment and fixtures.

6. That the British Welding Research Association's proposal on European welding productivity be considered in conjunction with these recommendations.

Should a European plan not materialize (or even one on a national scale), it would still be possible for a firm, or group of firms, to carry out such a scheme on its own, according to Mr. Gooderham.

Here's how low-level conduiting, a novel and practical departure from the conventional high-bay method, has resulted in a big savings for the production welding department of Douglas Aircraft Co.

Utilities surround welding machines

WELDING machine is served by low-level conduiting system. Stanchion-supported runs are installed "head high"—only 7 to 9 ft above production floor.

By James Joseph

A LOW-LEVEL conduiting system is providing the welding department of Douglas Aircraft's sprawling Torrance, Calif., plant with greater flexibility and a decreased need for maintenance.

All utilities — electricity, water, acetylene, oxygen, argon and nitrogen—are brought within about 10 ft of every welding machine.

This is done by means of stanchion-supported *runs* which are installed "head-high"—only 7 to 9 ft above the production floor.

Advantages of the low-level conduiting system include: *(1)* greater flexibility (allows welding machines to be moved whenever necessary); *(2)* prefabrication of runs for quick installation or removal; *(3)* minimal plug-in runs from welding machines to bus ducts (seldom longer than 10 ft), and *(4)* maintenance performed from the floor, without resorting to ladders.

Engineering Principle

Fully 6,000 lineal ft of the Torrance plant's 21,000 ft of utility runs are low-level. The remaining 15,000 ft of conventional high-bay lines serve as feeders to the low-level system.

The low-level concept, pioneered at Douglas, is spreading rapidly through industry. It appears to violate a time-honored engineering principle—that a plant should get its utilities overhead and out of the way.

"Not so," say Douglas maintenance engineers. "The overhead theory is more costly than useful. Admittedly, there are some plants and plant areas where high-bay conduiting is the only practicable way.

Drops Reduced

"But high-bay, overhead placement becomes something less than economical when serving a great concentration of machinery in a relatively compact area. This is especially true where departmental moves and machine rearrangements ebb and flow with every major contract."

High-bay conduiting also becomes burdensome where craneways interfere with utility runs.

The new low-level system falls midway between high-bay and fixed-bench connections. The former is too inflexible and too costly to maintain, Douglas engineers say.

The latter presupposes few welding machine shifts. It doesn't allow for expansion or contraction of departments with increase or decrease in load, or changes in welding and other manufacturing methods.

In Douglas' welding department, the entire area is served by low-level conduit—two lines of utilities serving individual banks of machinery. A typical low-level run involves conduiting and piping supported by floor-installed stanchions.

Common pipe stanchions 3 in. in diameter are spaced approximately on 20-ft centers. Atop stanchions rides a 4½ by 9½-in. bus duct, carrying 110 to 440 volts.

A patented "Unistrut" clamp supports all utility lines and is attached to a 4-in. I-beam (7.7 lb). An air line is carried atop the I-beam. Stanchions are embedded 4 in. into the concrete floor and grouted.

Clamp Holds Pipes

The plant has standardized six prefabricated types of low-level support structures. All carry utilities between 7 and 10 ft above the floor.

Four types are floor-installed. A

OVERALL view of Douglas' low-level conduiting installation indicates how electricity, acetylene, oxygen and other utilities are brought within about 10 ft of machines. System is said to possess greater flexibility.

fifth clamps to existing columns. The sixth features an angle iron clamped to existing overhead structural I-beams.

One type of support structure has stanchions 1½ in. in diameter, carrying small-diameter utilities. Pipes are held atop stanchions by the "Unistrut" clamp.

Another standardized structure carries air in a 4-in.-sq pipe, and the pipe supports a 4 by 4-in. lay-in duct. Stanchions are 3-in.-diameter common pipe spaced on approximate 20-ft centers. The square air-run stands about 9 1/3 ft from the production floor.

Although this structural unit is more costly, additional pipe expense is easily offset by reduced labor costs and by eliminating need for an I-beam. The lay-in duct, fed from a power panel, primarily supplies welding machines with relatively low power requirements.

Another standardized structure bolts to existing columns. In essence, it is a clamp arm fixed to a column with screw point caps. An arm supports a run of the bus duct, with necessary intermediate overhead supports.

A fourth type of support structure has a bus duct which is supported from each stanchion through a boxed channel iron structure. The latter is welded to the I-beam.

Between stanchions, as needed, the bus duct is additionally supported from the beam by 1½-in. wide by ⅛-in. thick metal bands. Bolted to the bands are "Unistrut" fixtures which are in turn clamped to the beam.

Galvanized Strap

Piping (typically a 2-in. air line) rides atop the I-beam and is held by a 1 by 10-in. galvanized strap. The strap is bolted to the top flange of the beam (5/16-in. bolt and nut, 3½-in. long).

Still another support structure carries air and an electrical duct. The rigid air-run is 4 sq in. and supports a lay-in duct. Stanchions are of 2-in. diameter and are 8 ft from the floor. A special feature of this structure is its adaptability as support for wire fencing, enclosing some security areas.

Fencing, which hangs from 1-in.-diameter pipe fastened to the stanchions, begins 6 in. above the floor and rises to a height of about 6 ft. Fence-supports add significant strength to utility stanchions and permit smaller diameters.

Plug-In Drops

The last type of standardized structure differs from the others in that it is a hanging fixture. It consists of ¼ by 2 by 2-in. angle irons (4 ft, 4¾ in. in length), bolted to existing overhead I-beams.

Such supports usually carry standard air and electrical headers, with intermediate supports as needed. Considering that plug-in drops (each about 16 in. long) hang from the headers, the effect is to bring utilities within about 6¾ ft of the production floor.

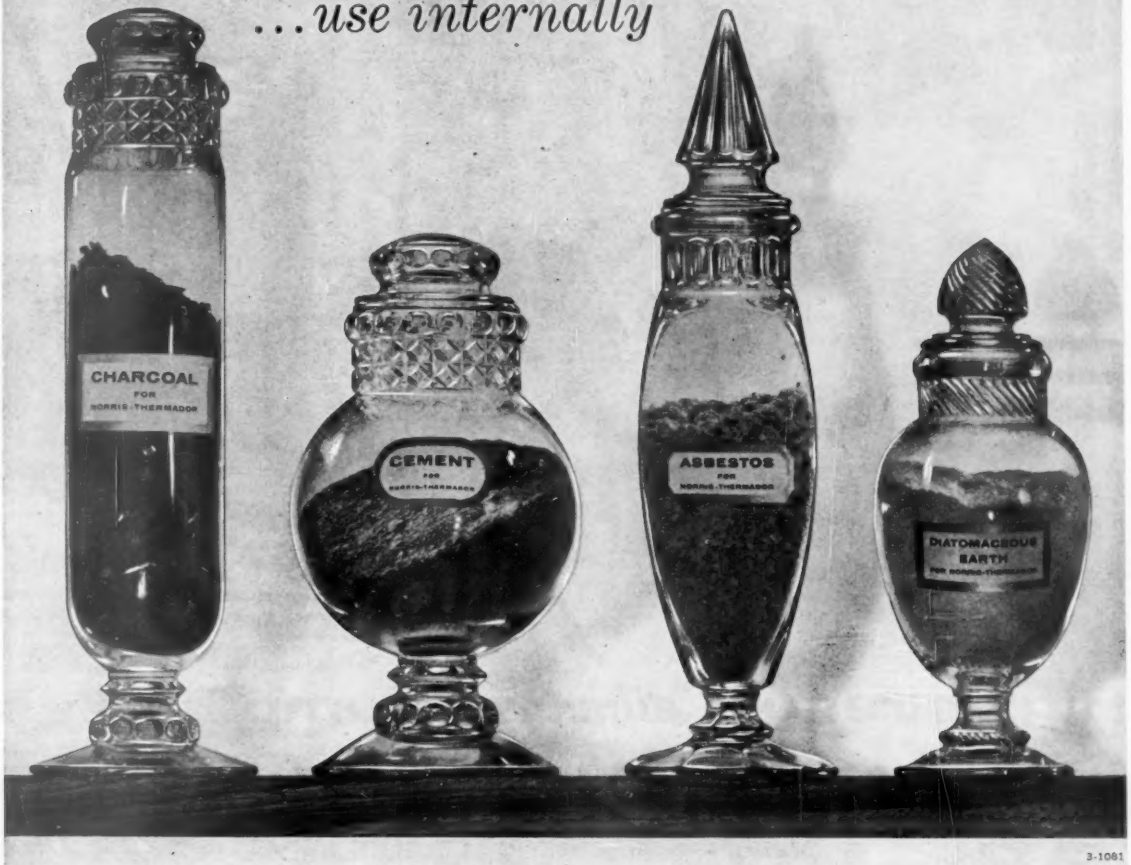
One obvious advantage of the low-level system is prefabrication. Another is that most runs can be inspected periodically from the floor or by using low ladders. Plugging-in to any duct becomes a tip-toe job rather than one involving ladders and interference with production machines.

However, chief advantage is flexibility. Any prefab run can be moved within a few hours. And because of prefabbing, almost all ducting and piping is reusable.

In quick-laying a typical utility

Rx FOR ACETYLENE CYLINDERS

...use internally



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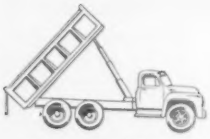
High-strength *aluminum* dump bodies welded fast by new process



For some time, dump truck operators have cast longing eyes at the light weight and high payloads that aluminum dump bodies would make possible. But nobody knew how to weld aluminum bodies strong enough or fast enough.

But recently two important things happened: the shielded arc, inert gas, consumable-electrode method was developed and improvements were made in Alcoa Alloy 5154. Used with the new welding techniques, alloy 5154 now provides a 25% increase in strength across welds and a 150% increase in ductility.

Speed is way up, too. Penn Body Division of Hockensmith Corporation, a leading dump body builder, butt welds $\frac{3}{16}$ inch sheet at speeds up to 30 inches per minute, compared with 16 inches per minute for the tungsten arc process. Depending on conditions and equipment, speeds as high as 60 to 80 inches per minute are now possible.

Now, companies like Penn Body offer a complete line of dump bodies that weigh only half as much as steel but with equivalent, or better, stiffness and impact resistance.

To make the bodies, Penn Body first butt-welds the floor from two sheets of 5154 alloy. Cross bracing is then added by skip-welding extruded beams of 6061-T6 alloy. Longitudinal members are welded in position and the sides and front, press braked from 5154 sheets, are welded in place.

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Toledo
Williams & Co., Inc.

OKLAHOMA
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Pacific Metal Co.

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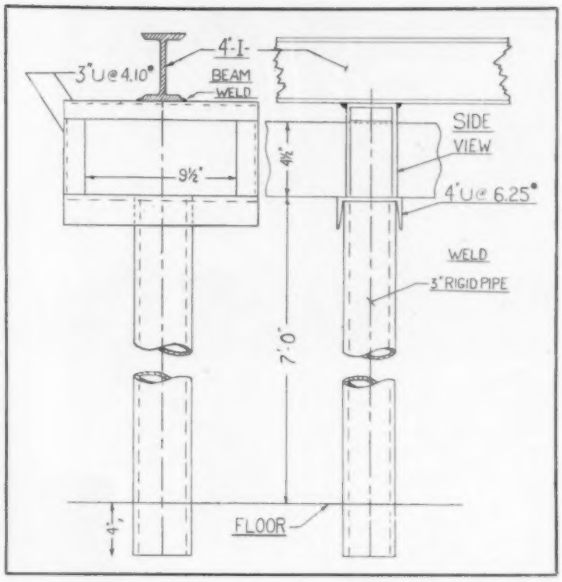
Machinery & Welder Corp.



ONE of Douglas' six types of low-level support structures has bus duct the underside of which is 7 ft above the floor. Piping (typically 2-in. air line) rides atop I-beam and is held by galvanized strap.

run (all work is done from the floor), a maintenance man first lays out a chalk line. Next, he screws into the floor a circular hardwood block at each stanchion location. Its diameter is the same as the stanchion's ID.

Cylindrical Guide

The block acts as guide for a special carbide core drill rigged to a cart. The cart is weighted with slag lead so it won't lift during drilling. An air motor is mounted on the cart. The core drill is powered by an air cylinder.

LOW-LEVEL conduiting used in production welding departments has resulted in easier maintenance. Most runs can be inspected periodically from floor or by using low ladders.

After the cart is positioned over the cylindrical wooden guide, the drill is lowered over it. Once the drill has been sufficiently started, it is lifted and the guide removed.

The drill then takes out a 4-in. core of concrete intact. Drilling time per stanchion approximates 20 minutes.

After the stanchion is set, it is grouted. Light-mix cement makes stanchion removal a simple job. When the stanchion's base is loosened with a chisel, the stanchion is jiggled until it is free. It is lifted clear, and the hole is filled and leveled. Removal takes about 10 minutes.

What of overhead clearance? Douglas, in three years of low-level installation has experienced only one service interruption due to breakage. One reason is that few mobile cranes move through low-level areas. And above heavily-trafficked aisles, runs are raised to conventional under-roof height.

"Average machine-to-utility run with low-level conduit approximates only about 10 ft," emphasize Douglas engineers. "Compare this with perhaps 40 or even 50 ft of run to every machine when utilities are high overhead."

That's low-level conduiting—a system already finding application in production welding departments from coast to coast.

AT Dockson Corp.'s booth (l. to r.) Wayne Anderson, George Schwendemann and Joseph M. Gray are ready to explain safety features of weldors' helmets and goggles.

HERE at display of Mine Safety Appliances Co., V. W. Buys, right, shows welding helmet to Fred Lambert, Minnesota Mining & Mfg. Co.

Safety first in welding . . .

. . . was a feature of the 44th National Safety Congress & Exposition held Oct. 22-26 in Chicago. More than 12,000 persons attended 200 sessions on accident prevention. Five of Chicago's largest hotels were used for meetings and discussion periods. The exposition, at the Conrad Hilton Hotel, contained more than 200 exhibits, many of which featured weldors' goggles, helmets and other safety equipment.

FIRE protection suit. Ultimate in industrial safety is this aluminized suit for high temperature use at booth of B. F. McDonald Co.

CONSTRUCTION of fire extinguishers is explained by James A. Dick (face to camera), The General Detroit Corp., to two visitors.

FACE protection was emphasized at booth of The Fibre Metal Products Co. by display of welding helmets, safety hats and similar equipment.

HELICOPTER service for visitors from congress to plant was operated by Sellstrom Mfg. Co. Shown at heliport on roof of Conrad Hilton Hotel are (l. to r.) pilot; Truman Baldwin; Cliff Wyatt; Roger R. Sellstrom; Don Wyatt; Ralph M. Coe and Don Bonney.

Large mill hammers taken from the scrap pile needed a 2" to 2¼" build-up on length... required approximately 5 lbs. of Manganese and Stoody 100, combined. Smaller amounts of build-up and hard metal are required for subsequent maintenance.

DON'T THROW AWAY 9/10 OF EVERY MILL HAMMER

The Victorville Lime Rock Company on the Mojave Desert some 75 miles from Los Angeles operates a plant for the reduction of high grade limestone that is processed for a great many uses, from face powder base to roofing materials. For intermediate crushing the company uses Williams hammer mills —and as usual, hammer maintenance is a problem.

When a Stoody representative first called at this plant he found a scrap pile of worn hammers that had been discarded in favor of standard replacements. 9/10 of the hammer was still there but so severely worn as to have lost its efficiency. A set of nine new hammers represents an investment of approximately $200.00, so the huge scrap pile, to the hard-facing specialist, had all the appearance of a gold mine.

Tests were undertaken to determine the cost of rebuilding such hammers; a copper form was clamped around the worn end to fix the shape and the finish length. Using the semi-automatic welder running Stoody Nickel Manganese, the hammer was brought back to just under finish size, then peened and hard-faced on the end and corners with Stoody 100.

The original experimental rebuilding job proved successful and the procedure outlined has now been established as routine. New hammers measuring 4"x5"x10½" weigh 45 pounds. Between four and five pounds of Manganese and Stoody 100, a high-alloy, wear-resistant material, are required to bring a worn hammer back to size. The semi-automatic welding procedure is extremely fast, depositing three to six times as much weld metal as is possible by the manual method. After rebuilding, each hammer is carefully weighed and balanced for proper operation of the mill. As wear occurs in service, the semi-automatic welder is used to apply additional Stoody 100 free hand to maintain hammer size and shape.

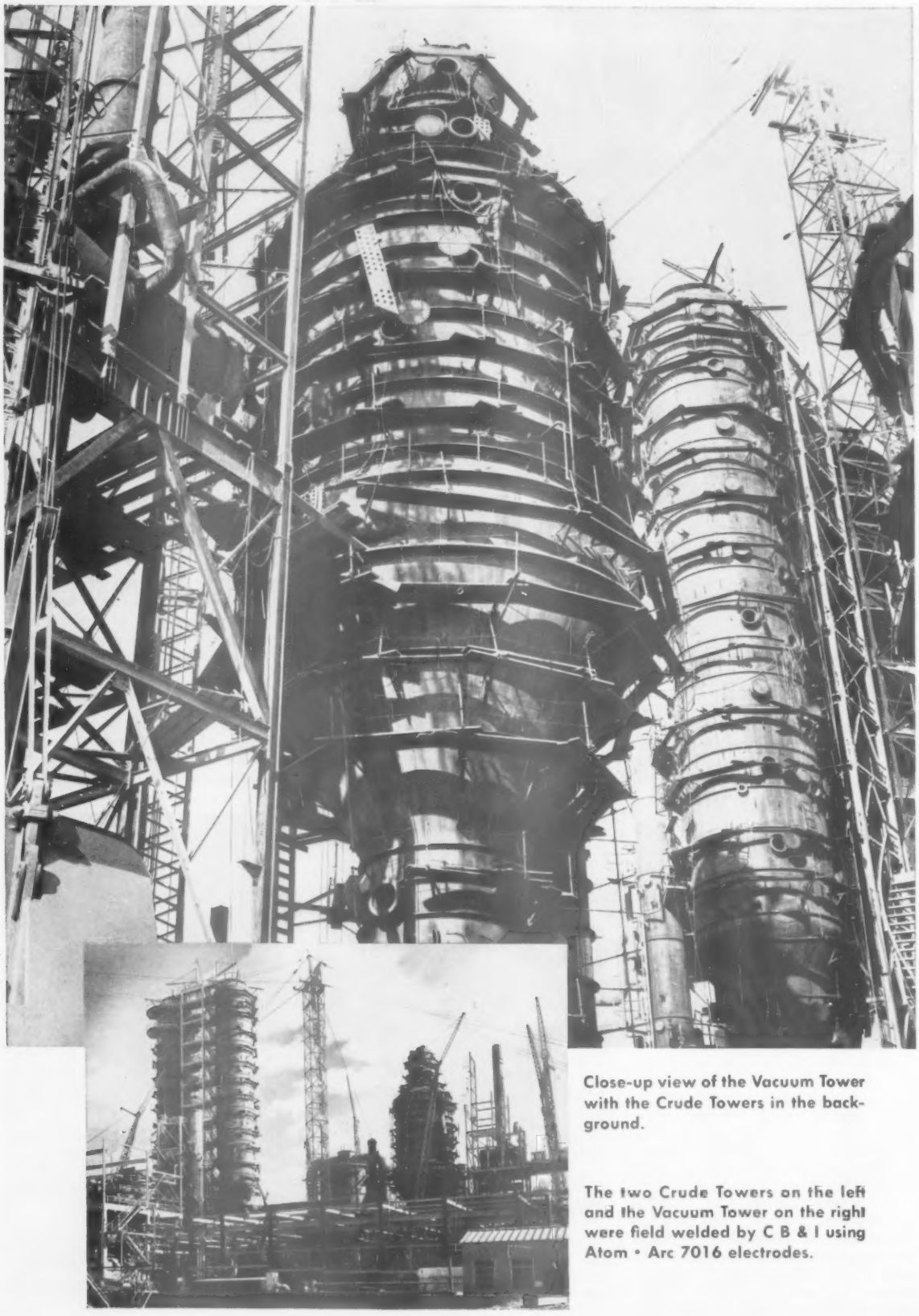
By the method described hammer costs are enormously reduced and the mill's performance is considerably improved.

Further information on the hard-facing of all types of crushing equipment is provided by various pieces of Stoody literature. See your Stoody dealer (you will find him in the "Yellow Pages" of your phone book) or write direct.

George Stone, Maintenance Superintendent, shows turn-table fixture which speeds welding. Forms surrounding hammers are copper, establish hammer size and height of build-up.

Other hard-facing includes these quarry shovel teeth. Points are rebuilt with Stoody Manganese and hard-faced with Stoody 100. Note the copper mold which shapes the point.

STOODY COMPANY
11941 East Slauson Avenue
Whittier, California



Close-up view of the Vacuum Tower with the Crude Towers in the background.

The two Crude Towers on the left and the Vacuum Tower on the right were field welded by C B & I using Atom • Arc 7016 electrodes.

Welded with ATOM·ARC 7016

CB&I reports more than 1 1/4 miles of field welds with less than 1/5 of 1% of X-rayed welds chipped and re-welded!

Chicago Bridge & Iron Company, one of this country's leading builders of tanks and processing structures, used Atom • Arc 7016 electrodes on this field erection job at the Sinclair Refinery in Marcus Hook, Pennsylvania. Their report on the building of this 138-foot Vacuum Tower and the two 176-foot Crude Towers makes amazing reading. For example, on the Vacuum Tower there were 2500 feet of field welds with only 8 inches of X-rayed welds that had to be chipped out and re-welded.

A summary report shows that there were 649 X-rays made on the job. 626 were satisfactory, 23 showed defects of one kind or another but only 15 were defects in field welding. A total of 6720 feet of welds (over 1 1/4 miles) were made with Atom • Arc 7016 electrodes and only 12 feet of X-rayed welds had to be chipped out and re-welded (less than 1/5 of 1%)!

All stainless clad sections in these towers were welded with Arcaloy 309 Stainless Steel Electrodes.

Quality workmanship is the paramount consideration at Chicago Bridge & Iron. Their report on this Sinclair job is enough to indicate that they get this high quality with Atom • Arc electrodes.

You'll want "Atom-Arc quality" on your jobs too. Contact your Alloy Rods Company distributor or write for informative Data Sheets.

Hortonspheroid® Storage Tank at Sinclair site, majority welded completely with Atom • Arc electrodes.
® Chicago Bridge & Iron Co.

Alloy Rods Co.

General Offices and Plant
York 1, Pennsylvania
Pacific Coast Sales Offices and Plant
El Segundo, California

no finer electrodes made . . . anywhere

—Courtesy American Platinum Works

REPORTED to be largest children's hospital in North America, St. Justine's (Montreal) will have radiant heating in all rooms. Heating installation will consume more than 30,000 oz of silver brazing material.

133-mile-long radiant heating installation:

Brazing tackles a big job in hospital

THE heating installation in the $30,000,000 St. Justine's Hospital, now under construction in Montreal, Canada, will consume 30,000 to 40,000 oz of BAg-1 silver brazing alloy.

The hospital's heating facilities will require 700,000 ft (or about 133 miles) of ½ to 3-in. copper tubing (excluding risers and branches) for a radiant heating installation with silver-soldered joints. Brazing is being done by acetylene gas only.

Preheating of tubing by the torches depends on shape, size and thermal conductivity of the metals and type of joint. It was found that proper heating prevented cracking due to thermal shock.

Reducing Flame

Overheating is avoided by using an active flux with a melting point slightly below brazing temperature range of the filler metal. In this way, melting of the flux indicates approach to proper brazing temperature.

A slightly reducing flame is used in brazing the tubing. To maintain uniform temperature at the joint, multiple-tip torches are used in many instances.

For best distribution of filler metal in the joint by capillary action, joint clearances are between 0.002 and 0.005 in. Although working pressure is only 75 psi, joints are being hydrostatically tested at 250 psi.

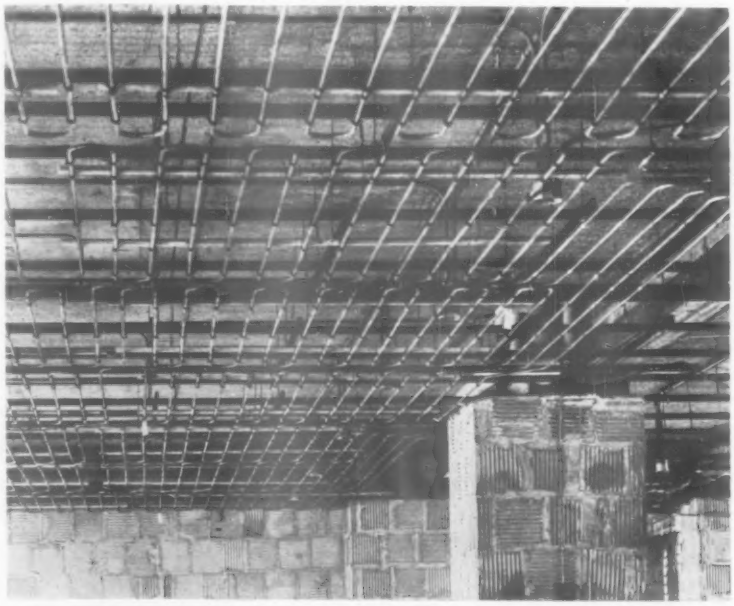
Reported to be the biggest children's hospital in North America, St. Justine's will have radiant heating in all rooms, including ceilings and walls. It will accommodate 850 beds.

10% More Piping

Those room facing north will have approximately 10% more piping for added protection against prevailing winds.

The building will have stairwells in the walls only. It will contain 3 steam boilers at 500 hp, and 1 electric boiler at 850 hp.

A second (and possibly a third) hospital requiring similar heating installations, and using silver brazing materials for joints, is now in the planning stage. One site has tentatively been located on the grounds of Montreal University.



HOSPITAL'S heating facilities will require 700,000 ft of ½ to 3-in. copper tubing for radiant heating installation with silver-soldered joints. All joints are being tested successfully at 250 psi, even though working pressure is only 75 psi. Brazing is done by acetylene gas.

Makes it possible to x-ray thicker sections –

cuts gamma ray exposure time

Read what the new Kodak Industrial X-ray Film, Type AA, does for you:

- Reduces exposure time—speeds up routine examinations.
- Provides increased radiographic sensitivity through higher densities with established exposure and processing technics.
- Gives greater subject contrast, more detail and easier readability when established exposure times are used with reduced kilovoltage.
- Shortens processing cycle with existing exposure technics.
- Reduces the possibility of pressure desensitization under shop conditions of use.

Whatever your present radiographic facilities, they'll do more work for you with Kodak's new Industrial X-ray Film, Type AA.

This film has greatly increased speed—especially pronounced with gamma rays and high kv. This means you can use shorter exposures with your gamma equipment. It also means you can radiograph thicker sections with your present x-ray equipment.

And with all this increased speed, the new film retains the fine sensitivity characteristics which made Kodak Type A the most widely used x-ray film in industry.

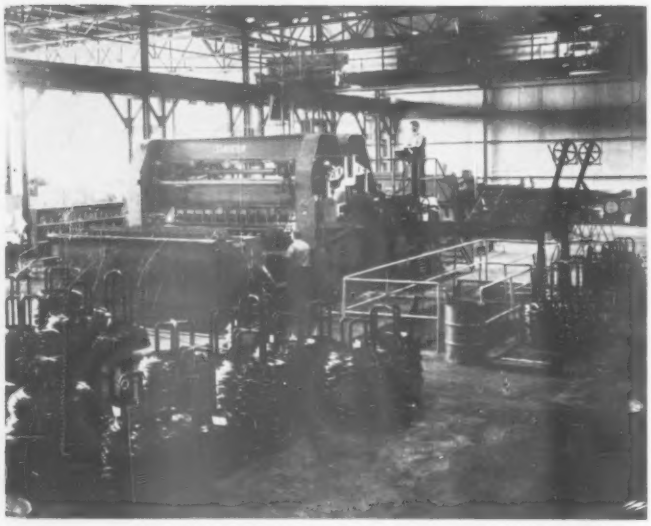
Kodak Industrial X-ray Film, Type AA, can save you time, can extend the possibilities of your present radiographic equipment. Find out all the details. Get in touch with your x-ray dealer or Kodak Technical Representative.

EASTMAN KODAK COMPANY
X-ray Division Rochester 4, N. Y.

Kodak
TRADE MARK

Machines turn out . . .

Reinforcement mats of welded wire



IN fabrication of welded wire reinforcement mats, line wire is fed through straightening unit. Each wire is straightened by as many as 10 grooved and staggered free-wheeling rollers.

COMPLETELY automatic equipment is using up about 1,000,000 ft of wire per hour in the production of resistance welded reinforcement mesh.

Designed and built by National Electric Welding Machines Co., Bay City, Mich., the equipment produces welded fabric for concrete roads, water intake and drainage conduits, buildings and similar constructions.

This equipment feeds numerous line wires—and from one to four cross wires—into position and spot welds them at each cross-wire junction.

All wires are fed from individual continuous-feed devices or payoff reels. A continuous horizontal feed and indexing stroke is used. The finished product is unloaded in the shape of large reels or flat mats of welded fabric.

Pressure Applied

Line wire feeds through a straightening unit containing as many as 10 grooved and staggered free-wheeling rollers.

From this straightener, line wires enter the adjacent spot welding unit. This machine mounts a vertical reciprocating ram and applies welding pressure for the entire mat width to a required maximum—200 in. and a total pressure of 60,000 psi.

This welding unit encloses its own power sources. Each welding transformer ranges from 7½ to 50 kva, and makes from two to four welded junctions. Series either paralleling the secondary circuit, or in balance, is used.

Mounted on either or both sides of the welding machine (as required for the number of cross wires to be fed) is the cross-wire feeding unit.

Indexing Strokes

This unit takes wire from its coils and pulls it through straightening rolls. Each cross wire is fed and cut off as it is automatically placed in position and welded to line wires.

As each cross wire is welded, a reciprocating platen with pulling fingers indexes fabric for the next position of the cross wires.

Welded fabric passes to a shearing unit where it is automatically cut after a predetermined number of indexing strokes. This operation completes the sizing of finished fabric coil or flat mat.

The shearing unit is adjustable for the proper position to match cross-wire spacing of fabric to be sheared.

The finished coil-winding reel—with its loop control—automatically winds fabric. Changing its speed automatically, the reel then winds the trailing end of fabric after it is cut by the shear.

Arm-type coil brakes hold the trailing end of this coil as it is manually tucked into the coil proper.

Equipment Capacity

By means of separating mandrels which are spread apart by large air cylinders, the finished coil is dropped on a ramp and rolled away from this last operation.

By spacing the winding reel a suitable distance from the shear, a majority of fabric sizes can be produced without slowing or stopping the welding operation.

The equipment produced by National can handle line wires 0.062 to ½ in. in diameter, and cross wires 0.306 in. in diameter. The range in wire spacing varies from ½ to 16 in., depending on size and use of welded fabric. Coated (galvanized) or uncoated wire fabric is produced on this equipment.

The machinery will automatically slit welded fabric into two or three widths. It will also trim overhanging ends of cross wires. Flush or extended ends can be made to exact dimensions.

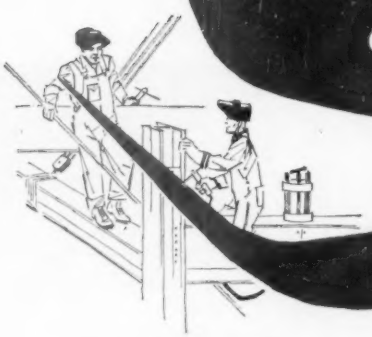
Multiple Wire Feeds

Production speeds depend on size of equipment and number of cross wires welded simultaneously. For the heaviest wire fabric (using a single cross wire weld and index), speeds of 25 to 35 welded cross wires per minute are obtained.

Medium and lighter fabrics can be produced at a rate of 60 operations per minute. Up to four cross wires are welded simultaneously at each stop.

Variations of equipment thus far produced for road and building pro-

hear about . . . the new **miller** MULTI ARC *combination ac-dc welders?*



SRAC ac-dc WELDERS . . .

. . . get metallic arc welding jobs done in a superior, time saving way because:

- Operator selects instantly, (1) ac, (2) dc straight polarity or, (3) dc reverse polarity. Here's versatility.
- Registered UNITRAN control circuit eliminates mechanical controls. Here's efficiency.
- No moving parts, plus excellent electrical qualities reduce maintenance and operating costs. Here's savings.

Available in 200, 300, or 400 ampere models with ratings at 60% duty cycle. Power Factor Correction can be supplied.

SRTA ac-dc WELDERS . . .

. . . for Both inert gas and metallic arc welding. Instant change from ac to either straight or reverse polarity dc. Power Factor Correction on all models. UNITRAN control circuit removes need for mechanical control and delivers outstanding uniformity throughout welding range. Built in high frequency, combined with balancing resistor, which is in series with transformer secondary, make this the welder for inert gas and metallic welding.

Available in 200 and 300 ampere models, rated at 60% duty cycle.

" . . . if it's MILLER you know it's the finest . . . "

New

MILLER ARCWELD welding electrodes are worthy of the MILLER name and reputation. Ask your distributor for some . . . you'll *like* the job they do.

Distributed in Canada by:
CANADIAN LIQUID AIR CO., Ltd., Montreal, P. Q.

miller

ELECTRIC MANUFACTURING CO., INC.
APPLETON, WISCONSIN

PAGE offers a line of —the right packaging—the

In ever-increasing numbers, users of welding wire are looking to PAGE for their wire needs. The one biggest reason is that they have found that PAGE—in a unique degree—has the *facilities, experience* and *special skills* to draw and furnish exactly the right wire for your welding jobs. And behind that lies a story.

All Processes Closely Controlled

PAGE is *the one supplier* of welding wire who is in a perfect position to control the chemical and physical properties of its products all the way from billet to rod to finished wire. That is because we purchase our raw materials to rigid specifications; we select heats of carbon, low alloy and stainless steels for certain optimum characteristics—then, upon delivery to the mill, we analyze representative samples for compliance with PAGE specifications.

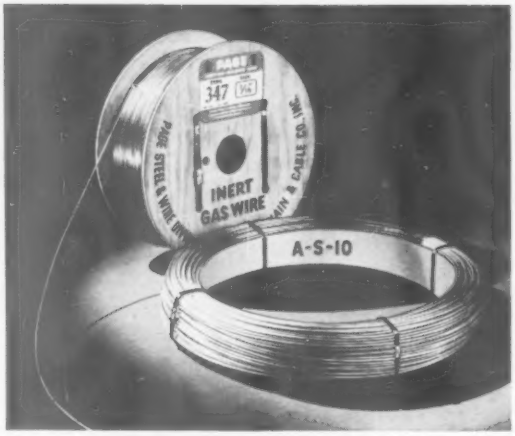
These purchasing and testing practices permit the production of wire capable of depositing weld metal which complies absolutely with welding requirements. *You don't have to compromise* when you buy, specify or use welding wire by PAGE!

Page Meets Today's Needs

One example of PAGE's facilities for furnishing a wide range of quality-controlled welding wires for modern applications is shown by our stainless steel automatic welding wire. To meet needs of recent developments in the field of inert gas welding, PAGE offers fine wires (.020″ to .09375″) for use in semi-automatic arc welding machines in which the arc is shielded with argon, helium or CO_2 inert gas. These wires, wound on non-returnable plywood reels, furnish the utmost in convenience and freedom of wire feed.

Wire for All Types of Welding

You will find many advantages in standardizing on PAGE welding wire for your needs—whether for automatic or manual use . . . arc or gas welding of all types. Not only does PAGE offer a wide range of analyses, as shown in the column at the right, but we have unsurpassed facilities for manufacturing wire to any desired size, temper or surface finish—and can furnish it promptly, in many methods of packaging, through the convenient nation-wide PAGE Distributor service.



The Right Wire— Wide Analysis Range

There are *26 different analyses* in the PAGE line. These cover the field of applications: heavy automatic submerged arc...light manual submerged . . . inert gas manual . . . automatic, tungsten or metal arc.

AUTOMATIC WELDING WIRE

CARBON STEEL...Any carbon from Armco (.025 max.) to high carbon (.90-1.10)

LOW ALLOYS...All the most popular welding grades.

STAINLESS...All standard AISI grades. Other types on request.

GAS WELDING RODS

Since 1914, the standard of quality, uniformity and satisfactory performance. PAGE offers an exceptionally wide range of rods—furnished in 36-inch lengths, in coils or on reels in the following materials: Mild Steel • Armco • Low Alloy • Carbon Steel • Stainless Steel • Manganese Bronze • Naval Bronze

BARE ELECTRODES

PAGE Bare Electrodes are supplied in any carbon from Armco to high (.90-1.10) carbon.

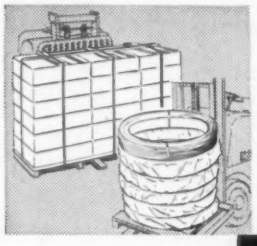
METAL SPRAY WIRE

Furnished as follows: Any carbon from Armco to 1.00 carbon • Low Alloy • Stainless Steel • Manganese Bronze • Naval Bronze

the right welding wires
right service—for modern needs

PAGE WIRES ARE PACKAGED RIGHT

PAGE Welding Wires are packaged in a wide variety of ways for the most complete protection and the utmost convenience in handling, in stocking and in use.

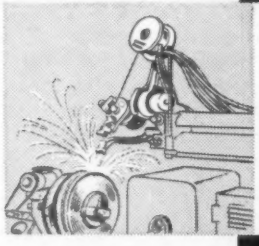


Wrapped Coils and Coils in Cartons

Single and palletized coils, each coil steel-strapped and wrapped in waterproofed paper. ...Also, coils in individual cartons, singly or palletized.

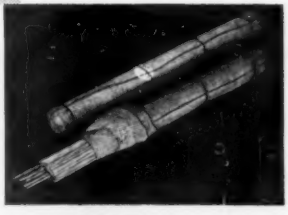
Welding Wire in Coils

PAGE A-S Automatic Welding Wire is regularly furnished in layer wound coils with cardboard liner, four Signode straps to facilitate coiling and easy unwinding.



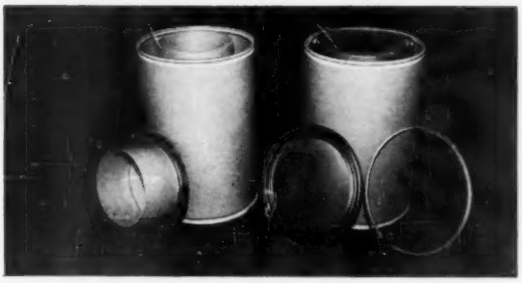
Handy Reels

PAGE Inert Gas Welding Wire is available on reels: Precision thread-wound on twenty-five-pound, non-returnable reels to fit all popular inert gas welding machines.



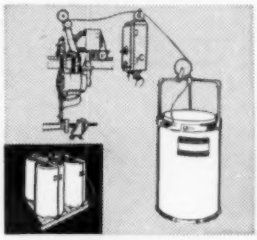
Gas Rod Packing

Gas welding rods are packed in 36" lengths in 50-lb. bundles—paper and burlap wrapped. Also in coils and reels (approx. 150 lbs.)—burlap wrapped. Stainless rods also come in 10-lb. fibreboard cartons.



LEFT: Pay-off-pak ready for filling, with "wire slinger" for uncoiling at extreme left. RIGHT: "Wire slinger" installed for feeding out wire; also, below, re-usable lid and retaining ring. Ring insures smooth feed-out of wire without snarls or kinks.

Sketch at right shows Pay-off-pak for continuous feeding up to 500 lbs. of wire without rethreading. Also (inset) lightweight Leverpaks. Both these containers protect against coil distortion... are easily opened, resealed, handled, stored.



PAGE Service Means Prompt Delivery From Local Stocks

You can get PAGE automatic arc welding wire, or oxy-acetylene welding rods quickly and easily from your nearby PAGE Distributor.

PAGE Distributors carry ample stocks from which your requirements can be filled without delay or inconvenience to you. This handy service not only saves you time in getting what you need, but makes it unnecessary for you to make a sizeable investment in inventory.

Send For These

Folder **DH-402A**—PAGE Submerged Arc and Inert Gas Welding Wire.

Booklet **DH-1277**—PAGE Gas Welding Rods.

Write our Monessen, Pa., office for *either or both*

ACCO products

ACCO

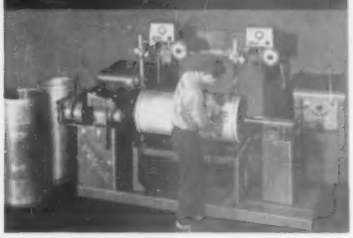
Page Steel and Wire Division

AMERICAN CHAIN & CABLE

Better Value

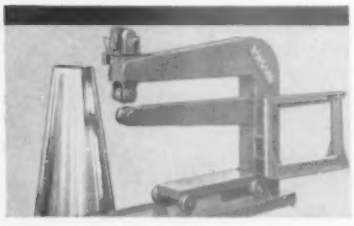
Monessen, Pa., Atlanta, Chicago, Denver, Detroit, Houston, Los Angeles, New York, Philadelphia, Portland, Ore., San Francisco, Bridgeport, Conn.

how to make fusion butt welding a *push-button operation*



CIRCUMFERENTIAL
automatic welding fixture
Designed for circular welding of components with automatic chucking and ejection of parts and transfer. Chuck expands internally for sizing. Surface speed to 300″ per min.

LONGITUDINAL *automatic fusion butt welding fixture*
Hold-down fingers with "toe touch" control lock parts in position for welding. Back-up mandrell with up to 6 copper inserts permits fast job changes. Handles all weldable metals .005 to 1″ thick and lengths from 2′ to 12′.



ROLL PLANISHING FIXTURE
Cold-rolls and smoothes fusion welds (circ. & longit.) under controlled pressure up to 10 tons. Handles 1¾″ to 10′ dia. and lengths to 16′.

Write today for further information
785 No. Prairie Ave., Hawthorne 2, Calif.

Airline WELDING
WELDING & ENGINEERING
FIXTURES & POSITIONERS
"guides the arc to the mark"

CROSS wire feeding unit takes wire from coil or spool and pulls it through straightening rolls. Each cross wire is fed and cut off as it is automatically placed in position and spot welded to line wires.

grams include: *(1)* single or multiple cross wire feeds, and *(2)* cross wire load and feed from wire coils or spools and, on heavier wire gages, by an automatic hopper feed, which handles pre-cut and straightened cross wires.

On extremely high-production equipment using multiple cross wire feeds, two finished fabric winding reels are used. While one is winding, the other is tucked and unloaded. Consequently, both welding machine speed and production are maintained.

Butt Welder Used

Electrical (transformer) capacity varies with fabric to be produced. Larger machines have as many as forty 50-kva, single-phase welding transformers (for a total of 2,000 kva).

Electrical control is almost equally divided between phases of the three-phase power run to the machine. The ignitron tube contactor, weld timers, and suitable protective or overload devices provide control.

To insure continuous running of the wire supply from spools or pay-off coils, a portable or carriage-mounted butt welder is used to connect new coil ends as each coil is used up.

The automatic wire welding equipment is of steel mill design and construction. Machines of this type have been in production since 1945. About 25 of these machines will soon be in production, assuring industry a continuous supply of welded concrete reinforcement fabric.

gloves of WELDTAN Leather
out-perform all others

Test after test by authoritative sources has proved that WELDTAN — a new super-chrome tanned cowhide split — can and does outperform any other work glove leather. It provides more heat resistance and softness than even a horsehide split. It has more abrasive and tensile strength than any leather has ever had before. And all this is yours in gloves that cost just slightly more than the ordinary. Gloves of WELDTAN Leather actually save you money by lasting longer—serving better. Order them today from any reputable glove manufacturer or safety supply house.

GENERAL SPLIT CORPORATION
FIVE STAR QUALITY
World's largest producer of glove leather splits
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"140" Monel electrodes stop corrosion, erosion, and cavitation in 68,000-lb. cast-steel valve. The fabricator — Willamette Iron and Steel Company, Portland, Oregon — deposits weld metal on seating surfaces of the valve body (shown here) and plug. Then they machine the Monel deposit to form the final seating surfaces of the valve body and plug.

450 lb. Monel overlay protects 68,000 lb. steel valve from corrosion

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Overlaying with "140"® Monel® nickel-copper alloy Electrodes is a practical way to get corrosion resistance when a part is too big to warrant making it entirely of this alloy.

Take this 68,000-lb. cast steel valve for handling drinking water. Just 450 lbs. of Monel overlay protect its vital areas from corrosion, erosion and cavitation.

Overlays like this are practical because it is easy to get strong, ductile, non-porous deposits with "140" Monel Electrodes. And the special low-carbon flux coating permits crack-free overlays directly on steel.

Do you have a similar problem? A part too big to make of solid corrosion-resisting metal, or a part with only one surface exposed to corrosives? "140" Monel Electrodes may be the economical way for you to obtain superior corrosion resistance.

Nickel and Inconel® overlays

When you want the advantages of a nickel overlay on steel, use Inco's "141"® Nickel Electrodes. And for resistance to high temperatures and corrosion, use "142"® Nickel-Chromium Electrodes.

For more information about the "140" series of electrodes, write Inco for Technical Bulletin T-2. It's a helpful, 44-page guide to "Fusion Welding of Nickel and High Nickel Alloys." A copy is yours for the asking.

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Filler metals for joining

—*Courtesy Lincoln Electric Co.*

FILLET welds at inspection port rings of manifolds are made with ⅛-in. iron-powder electrodes. Two such electrodes are sufficient at each port (as against three conventional rods). A 25% saving in welding time has been recorded.

By Orville T. Barnett*

JUST three years ago a new concept in manual metal arc welding—iron-powder electrodes—burst upon the welding scene. In a relatively short time, this electrode type has gained solid production usage amounting to more than 10% of all mild-steel electrode tonnage consumed.

Seldom has a product won such widespread acceptance so quickly. To emphasize the great welding speeds of these new electrodes, manufacturers selected trade names incorporating such *speed* words as "comets," "jets" and "rockets."

Design Requirements

Iron-powder or contact electrodes actually were introduced in the United States by the Dutch in 1946. A thick, conductive coating containing a liberal amount of iron powder characterized this new contact electrode. The *contact* designation derived from the fact that an arc could be established between coating and workpiece, as contrasted with nonconductive coatings designed by American electrode manufacturers.

Notwithstanding some years of sales effort, this product could not catch on among American welding fabricators because of unacceptable cost and performance factors. In 1953, however, a domestic iron-powder electrode designed to satisfy U.S. requirements met with immediate success and established the flood-tide of iron-powder electrode products.

Differences between manual electrode design requirements acceptable to European and American welding engineers have existed for many years. Both groups produce good products even though they are not acceptable to each other. The E6020-30 concept, as well as the latest iron-powder trend, originated in Europe.

Speed was the keyword to success for iron-powder electrodes—it meant lower costs to production men. Although the electrodes were more expensive in cents per pound, deposited metal was appreciably cheaper.

Performance Checks

Added bonuses came from weldor satisfaction because the coating could be rested on the work in many applications, and because slag came off with little effort. No longer was deposition rate limited by heat capacity of core wire plus a relatively thin coating.

Iron in the coating now melted to increase quantity of deposited metal, while at the same time providing a molten pool with less superheat and less penetration. The deep crater protected melted metal from detrimental ambient gases in the atmosphere.

Today, there are four basic types of iron-powder electrodes, and their relative popularity is listed in Table I. By all odds, the E6024 type is a fillet-welding wonder-worker that accounts for well over 50% of total iron-powder electrode consumption.

Any welding engineer who has not run cost and performance checks on E6024 versus E6012 electrodes on actual production applications is asleep at the switch.

There are two low-hydrogen iron-powder electrode types: lime-base for all-position welding, and titania-base for downhand welding. Actually, the two electrodes contain lime: those containing less than 8% TiO_2 are termed lime-base, and those with more TiO_2 are called titania-base. Production advantages include improved deposition rates and surprising quality.

Heat Capacities

There exists some confusion concerning relative usefulness of the E6013 iron-powder electrode type in

*Assistant manager, Metals Dept., Armour Research Foundation of the Illinois Institute of Technology, Chicago.

Plant, Research Laboratories and World Headquarters

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STRONGER WELDS

EUTECTIC Welding News

PUBLISHED BY EUTECTIC WELDING ALLOYS CORPORATION, 40-40 172 STREET, FLUSHING 58, NEW YORK, N. Y.

Cracking Problems in Cast Iron Weld Deposits Examined

Production and maintenance welding of cast iron has been practiced for decades. Until recently, it was considered an art requiring considerable welding skill because of cast iron's poor inherent properties. But continued exploration by "Eutectic" has made the techniques of cast iron welding capable of scientific control.

At the National Metal Show, attention was again directed to "Eutectic's" advanced research in this field. Joseph E. Quaas, Director of Manufacturing and Production at "Eutectic," addressed the fall meeting of the American Welding Society in Cleveland, Ohio, on "Aspects of Crack Sensitivity in Machinable Cast Iron Deposits." Mr. Quaas discussed the problems of welding both gray and nodular cast irons. He analyzed various types of coated electrodes, such as 99 per cent nickel, 55 nickel-45 iron, and monel grades, and recounted the incidence and degree of cracking that occurs with these electrodes and with electrodes of various coating formulations. This work helped to perfect the new, non-cracking, high tensile, machinable electrode for cast iron, Xyron 2-25. Hardness surveys, tables on physical properties and chemistry of test blocks, and macro and microphotographs depicting various weld structures were made available to the audience.

Results of "Eutectic's" research and development program are apparent in the newest cast iron electrodes and rods, such as EutecRod 144FC Super, which welds gray and alloyed cast irons at lowest possible application temperatures and produces dense, sound weld deposits, with minimized warping, distortion, stress, and embrittlement caused by conventional high heat cast iron rods. **(A-20)**

"EUTECBOR" #9 PRODUCES "LOW HEAT INPUT," LEAKPROOF WELD

"EutecBor" #9 recently provided an answer to the problem of joining sections of steel tanks without the use of flux, and without fusion of the base metal, so that the joint would withstand Freon gas and pressure of 300 lbs.

Leakproof re-joining of the tank sections was necessary. Conventional welding rods were found unsatisfactory because of their high application temperatures. "EutecBor" #9, embodying Eutectic's "Low Heat Input" process, produced a distortion free and absolutely leakproof joint.

"EutecBor" #9 has excellent corrosion resistance to various atmospheres and many acids. It can be used on steel, cast iron, high chromium and nickel alloys. Fusion of the surface of the base metal is not required. "EutecBor" #9 is very fluid and will flow through a lap joint. **(A-21)**

EUTECROD 1801 SAVES 60% IN PRODUCTION COSTS

A company manufacturing book binding machinery now saves 60% of the cost of manufacturing a component part by using EutecRod 1801.

The company fabricates hundreds of these parts weekly. Instead of machining the part from one piece of stock, the company now uses EutecRod 1801 to join a thin blank of monel to a piece of drill rod. Time required has been cut by 85% over the previous slow and costly method. Practically no finishing is necessary and the bond is strong and ductile.

A low melting, high silver content alloy, EutecRod 1801 has good corrosion resistance. Designed to bond very readily carbon and alloy steels, copper and nickel alloys, its ultimate tensile strength is up to 90,000 psi. **(A-22)**

XYRON 2-25 WELDS "PROBLEM" CAST IRON

Eutectic's cast iron electrode, Xyron 2-25, has again demonstrated its ability to weld "problem" cast iron with no cracks, "leakers," or stress formations.

An Oklahoma manufacturing company tried to repair cast iron cooler heads with many conventional cast iron electrodes. All produced pin holes and water leaks. A Eutectic District Engineer recommended Xyron 2-25, specially designed for cast iron and cast iron alloys. Eutec-ChamferTrode was used to gouge out cracks. Grooves were then covered with Xyron 2-25, ground out, and re-welded with Xyron 2-25. After welding, cooler heads were completely free of pin holes and water leaks.

The shallow, uniform penetration and alloying to the base metal of Xyron 2-25 permits easy slag removal and gives high strength welds with maximum machinability. Welders find Xyron 2-25 suitable for all types of cast iron repairs and for joining cast iron and cast iron alloys to steel. **(A-23)**

EUTECTRODE 680 AC-DC SAVES $1000 STEEL WHEEL, AVERTS TWO MONTHS "DOWNTIME"

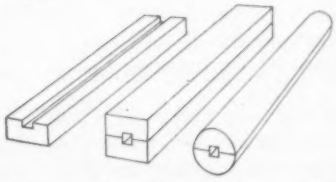
A Eutectic District Engineer's experience and knowledge of welding recently saved a Georgia mining company $1000 and two months "downtime." Damage to a ratchet wheel on an expensive piece of equipment was believed unrepairable and the company ordered a new wheel: cost, $1000; delivery time, at least 60 days.

The company also consulted a Eutectic District Engineer. He advised welding the wheel with EutecTrode 680 AC-DC, a high tensile electrode for very high alloy and carbon steels. EutecTrode 680 AC-DC has a "Frigid Arc" coating which produces a smooth, dense weld, free from porosities. After repair with EutecTrode 680 AC-DC, the equipment was immediately put back to work and the order for a new part cancelled.

Welds of EutecTrode 680 AC-DC have high strength, wear, and impact and high resistance to corrosion and heat. Ultimate tensile strength is up to 120,000 psi. **(A-24)**

EUTEC-TINWELD SOLVES UNUSUAL SOLDERING PROBLEM

A manufacturer utilized Tinweld's easy application and high strength to solve an unusual problem—the fabrication of a die to cut tungsten wire. He first joined two pieces of grooved steel with Tinweld, a paint on solder type paste. Tinweld's good wetting qualities and freedom from spatter prevented any solder from entering the groove.



The square of steel was then turned to a cylinder and heated, the solder removed and the halves heat treated. Tinweld was again used to join the halves. In operation, the die withstands the strain of clipping thousands of pieces of tungsten wire.

Tinweld can be used for all common metals except aluminum and magnesium and is particularly suitable for precision work. **(A-25)**

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comparison with standard E6013 and E6024 electrodes. No doubt this problem has arisen in thousands of applications. Further studies will be needed to resolve this question into definite areas of acceptance.

Somewhat limited popularity of the E6027 type has a twofold explanation: first, E6020 electrodes have been losing out to automatic and semiautomatic welding processes; second, heat capacities of some joints are insufficient to permit use of the faster E6027 electrode.

Where manual electrodes are applied to deep grooves, E6027 types prove their value. Some objectionable slag-removal qualities associated with early designs have been largely overcome.

Now let's take a sharp look at speed and costs. There was a raucous dogfight when these iron-powder electrodes moved into a shaky electrode market in 1953.

Electrode manufacturers shook their heads in disbelief—selling prices of the new electrodes were too high, they said. Deposition efficiency was low. Length of fillet weld was reduced. Ductility was far below acceptable standards.

The list of complaints was long—*and would not stand up*, as time has proved.

Cost Comparisons

In Table II, some cost considerations are presented. Iron-powder electrodes are represented by the most popular conventional electrode, the E6012.

Here are the facts.

Iron-powder electrodes are less efficient . . . *True.*

Total length of fillet weld which can be made from a box of iron-powder electrodes is less than that made by a standard type . . . *True.*

It is generally necessary to use iron-powder electrodes in diameters smaller than average . . . *True.*

Iron-powder electrodes cost more per pound . . . *True.*

Iron-powder electrodes aren't any faster and actually cost more when the smaller-diameter requirement is considered . . . *FALSE.* That false statement is more important than all the others.

Because costs vary from plant to plant, each welding engineer must run his own cost comparisons. Generally speaking, total welding costs are made up of power—2%; investment—4%; electrodes—8%, and labor plus overhead—86%.

To find the relative situation for your plant, leave out the 4% investment item and calculate the rest. Even assuming that you replace ¼-in. E6012 electrodes with 3/16-in. E6024's, you'll experience an increased productivity of about 60%.

Ductility Values

That kind of saving makes a welding engineer a good foot taller in his management's eyes.

The mechanical property information in Table III indicates that the high strength of most iron-powder electrodes may lead to an eventual E70XX classification.

In the beginning, E6024 electrodes displayed some erratic ductility values. Machined and tested as 0.505 tensile bars right after welding they might have shown 15% elongation in 2 in. After two weeks on the shelf because of a machine shop bottleneck, elongation might have improved to 20%. Some aging in boiling water for 48 hours could have increased elongation to 24%.

So the AWS-ASTM mild-steel arc welding filler metal specification now recommends aging machined specimens for 24 to 48 hours at 200 to 220 F before testing at room temperature. It might be easier and more straightforward to eliminate the aging treatment in favor of a lower ductility requirement in the specification.

Inspection Standards

An explanatory note regarding the effect of benefits to be obtained through normal room-temperature aging of production weldments could satisfy an engineer who might not be pleased with a 12% specification value. Of course, no one knows how important the difference between 12% and 17% really is in practice. Probably it is not very significant.

Impact strengths are good, with low-hydrogen types displaying desirable values at low temperatures. Charpy keyhole specimen values at subzero temperatures are considerably above the Charpy V-notch figures which must be kept in mind when preparing inspection standards. Corrosion resistance, X-ray qualities and densities are all good.

The greatest cost advantages in the world are meaningless unless the weldor likes to use the electrodes. It is indeed fortunate that welding operators waxed enthusiastic over the new iron-powder types. They immediately noted that pronounced freedom from spatter made clothes last longer and eliminated most of the annoying

TABLE I—Relative popularity of iron-powder electrode types

Rank	AWS-ASTM Classification Number	Description
1	E6024	Rutile type for all-position welding similar to E6012
2	*	Low-hydrogen types similar to E6016
3	*	Rutile type for all-position welding similar to E6013
4	E6027	Iron-oxide type for horizontal fillet and downhand welding similar to E6020

*Not yet classified but under active consideration by AWS filler metal committee

Table II—Deposition characteristics of iron-powder electrodes

Type	Diameter (in.)	Efficiency—lb of weld metal per 100 lb of electrodes	Length (ft) of 1/4-in. fillet per 50 lb of electrodes	Ft per hour of 1/4-in. fillet welds
E6012	3/16	77	364	40.9
"	1/4	75	354	50.7
E6024	3/16	69	326	81.5
"	7/32	67	316	90.2

tt
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Five years ago, the generally accepted practice among engineers and contractors was to weld non-critical pipe larger than 2-inches and thread the smaller sizes. Today, that dividing line has gone down; much piping as small as ½-inch is now being welded. In small piping as in large, the big reason for welding is *to save money* . . . in installation cost, in material cost, in maintenance cost. See next page for typical results. For the small pipe jobs, too, you get the *most for your money* when you specify and buy TUBE-TURN* Welding Fittings and Flanges. Your nearby Tube Turns' Distributor can give you speedy service in sizes from ½-inch to 42 inches!

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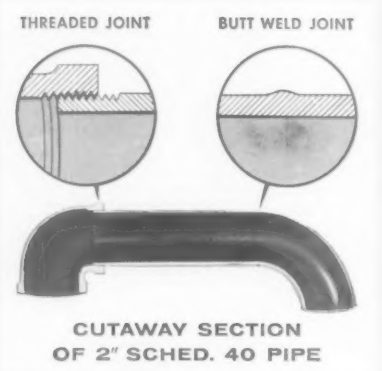
SMALL DIAMETER PIPING...*why it pays to specify welded construction with* TUBE-TURN *Fittings*

NEVER LEAKS. Welded joints are permanently as strong and leakproof as the pipe itself. Photo shows welded lube oil lines for one of four diesel engines, replacing threaded lines which leaked. If welded in first place, would have saved $4000 replacement cost. Pipe is 2½" with TUBE-TURN Fittings.



CUTAWAY SECTION
OF 2" SCHED. 40 PIPE

SAVES MATERIAL. Threading cuts half of pipe wall away as shown. The welded joint is as strong as the pipe. An installation of Schedule 40 pipe, welded, is stronger than Schedule 80 threaded. Hence, for equal strength welded piping can cut material costs 30-50%.

TAKES LESS TIME to weld than to thread pipe above 2" and about equal time for smaller sizes, according to recent tests on hundreds of joints made by many different pipe fitters. Welded joints in 1½" piping such as the school heating line shown, averaged 7 minutes compared to 8 minutes for threading and tightening fitting.

IS COMPACT, NEAT. This installation of 1½" and 2" boiler blow-off piping shows ability to nest welded lines close together for better layout and streamlined appearance. Also, insulation, where needed, is easier to apply.

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spatter-burns they suffered.

Handling characteristics of E6024 electrodes proved excellent. The weldor could ride the coating on the work or hold a slight, free arc. Tilting the electrode approximately 15 deg in the direction of travel produced fillet welds of desirable cross-section, with a fine ripple reminiscent of automatic welding.

Noisy Tools Eliminated

While there is an increased amount of slag with iron-powder electrodes, it is readily controllable. Slag inclusions do not show up in the weld metal.

On cooling, slag on fillet welds may curl away from the bead in a self-cleaning performance that saves money and effort. If the slag doesn't pull free by itself, a very light tap from a hand tool does the job. Noisy, energy-hungry power tools can therefore be eliminated for an additional saving.

Contact electrodes introduced by the Dutch would establish an arc between coating and workpiece. But a highly-conductive coating on an electrode that performs exceptionally well with a-c introduces an undesirable hazard to the perspiring weldor.

A completely nonconductive, slagged-over electrode end, however, spells trouble in restriking. Therefore, a workable compromise has been achieved by American designers—just enough conductivity to permit easy restriking has been designed into the coatings.

—Courtesy Harnischfeger Corp.

ELECTRODES containing iron powder are used in fabrication of large weldment.

Crater Filled Up

Because arc voltage of the heavily-coated iron-powder electrodes is at least 50% higher than voltage of conventional electrodes, a deep crater results when the arc is broken. The old technique of hesitating to fill this crater no longer gets the job done.

Before the end of the fillet is reached, the skilled weldor carries a long arc ahead and welds back to the prior crater location allowing new molten metal to flow into and fill up the crater. With a little practice, this procedure can be mastered.

While the great popularity of E6024 electrodes was understandable, rapid establishment of low-hydrogen iron-powder electrodes in the number two popularity spot was unpredictable.

Low-hydrogen electrodes have consistently exhibited outstanding mechanical properties. But their handling characteristics caused concern among weldors and welding engineers alike.

Field Erection Jobs

In the downhand position, or even for horizontal fillets, low-hydrogen electrodes were tolerable. In vertical and overhead positions necessary to pipe welding and to field-erected vessels, the wizardry required of most operators was beyond their greatest skill. Adding to these problems, out-of-position welding speeds were exasperatingly slow.

Naturally, the new low-hydrogen electrodes containing iron powder

TABLE III—Typical mechanical properties of iron-powder electrode deposits—As welded

	E6024	Low H_2 iron-powder all-position	Low H_2 iron-powder downhand	Rutile (E6013-type)	E6027
Yield strength, psi	65-75,000	65-72,000	64-71,000	59-68,000	52-58,000
Ultimate strength, psi	77-87,000	73-87,000	71-86,000	69-82,000	62-68,000
Elongation, % in 2 in.	17-22	25-30	25-31	22-28	25-30
Reduction of area, %	30-45	67-75	50-62	35-47	40
Impact strength, ft-lb	20-35*	47-55*	n.a.	23*	25-35*
Endurance limit, psi	n.a.	n.a.	n.a.	n.a.	30-34,000
Corrosion resistance	Good	Good	Good	Good	Good
X-ray quality	Good	Excellent	Excellent	Good	Excellent

n.a.—not available
**Charpy keyhole*

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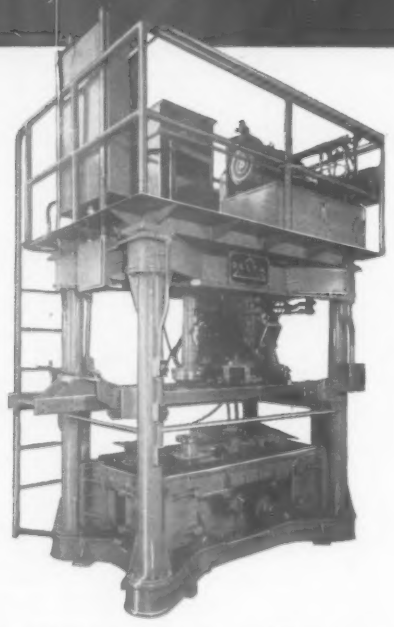

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—Courtesy Alloy Rods Co.

WELDOR is using E6016 low-hydrogen electrodes containing iron powder in fabrication of large forged steel weldment.

couldn't escape trials for downhand and horizontal fillet work. Here they gave proof of being faster and of good quality.

Next, the more lightly coated all-position iron-powder types went on field erection jobs. Speed was better than the fastest conventional electrodes, even though the useful maximum diameter decreased from 3/16 to 5/32 in.

Mechanical properties of deposited weld metal were the best ever employed for this type of structure. X-ray defects decreased to an all-time low. Consequently, many field welding supervisors are now losing their ulcers.

Iron-powder electrodes are here to stay. They have joined the parade of manual arc welding achievements which began when coated electrodes replaced bare wire.

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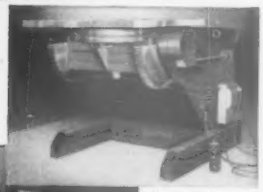

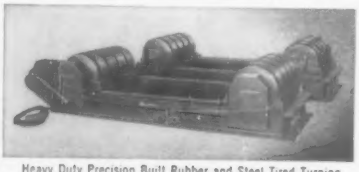

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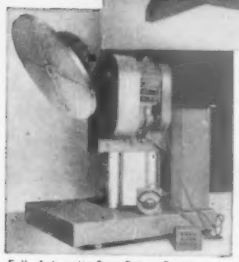

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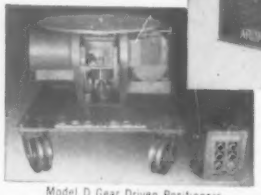
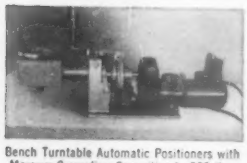


Heavy Duty Floor Turntables with precision speed control and Magnetic Braking, used for welding, burning, X-raying, etc. Capacities to 75,000 lbs., various heights and speeds.

Model D Gear Driven Positioners. Compact, Precise, Rugged. Capacities to 1000 lbs.



Bench Turntable Automatic Positioners with Mercury Grounding Capacities to 500 lbs.

Patented

Aronson Universal Balance Positioners (T. M. Reg.) position your weldments effectively, instantly for downhand welding. Capacities to 2000 lbs.

Rugged Head and Tail Stock for positioning bulky weldments between centers. Table Backup for Zero Deflection, Magnetic Braking. Capacities to 160,000 lbs.

Aronson Twinner Permanent Magnetic Clamps, six models with thousands of uses in welding set-up work. Write for bulletin.

POSITIONEERING with Aronson

POSITIONERS

UNIVERSAL BALANCE® POSITIONERS
BENCH TURNTABLE POSITIONERS
GEAR DRIVEN POSITIONERS
HEADSTOCK-TAILSTOCK POSITIONERS
TRACTRED® TURNING ROLLS
RUBBER-TIRED TURNING ROLLS
RAIL CAR POSITIONERS • TURNTABLES
FULLY AUTOMATIC POSITIONERS
MAGNETIC WELDING CLAMPS

ARONSON offers you over 200 PROVEN Standard Stock Models of Quality POSITIONERS "POSITIONEERED" to your exact requirements

Write for detailed engineering data

Quality POSITIONERS by Aronson MACHINE COMPANY
ARCADE, NEW YORK

LIQUID oxygen converter unit was demonstrated for IOMA members by J. J. Hourihan of Cambridge Corp. IOMA Secretary J. F. Wagner examines unit, which has liquid equivalent capacity of 3,000 cu ft of oxygen gas.

IOMA meets in Chicago

By a Staff Member

MEETING in Chicago for their regular Fall business meeting, 125 members of the Independent Oxygen Manufacturers' Association discussed recent trends in the oxygen industry.

Represented, in addition to U. S. firms, were oxygen producers in Hawaii and Mexico. In the space of two and a half days (Nov. 5-7), a group of 13 speakers made presentations ranging from "The new oxygen steel process" to "Inventory control and catalogs."

Guy Savard of Canadian Liquid Air, Ltd., Montreal, covered the former topic; the latter presentation was made by W. A. Rice of Virginia Welding Supply Co., Charleston.

Elected president for 1957 at the meeting was B. F. Connor, Delta Oxygen Co., Memphis. Other officers elected: C. W. Steele, vice president; John Coyne, secretary, and I. F. Fausek, Jr., treasurer.

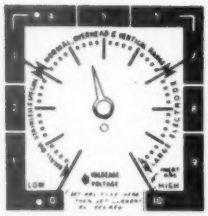
Of particular interest to participants was the presentation and demonstration of a new liquid oxygen converter unit (see photo). Called the "Loxette 3,000," the converter has a liquid equivalent capacity of 3,000 cu ft of oxygen gas. Manufactured by Cambridge Corp., Lowell, Mass., the unit will deliver oxygen at a basic rate of 150 cfh.

...for those tough "HARD to WELD" jobs

VICKERS Controlarc* DC Welder

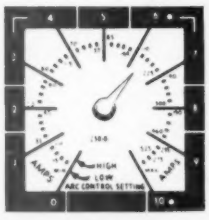
Gives You REMOTE CONTROL of CURRENT and TYPE of ARC

Right at your fingertips—exact control—compact, light weight for truly versatile performance



SELECTION OF ARC TYPE

for different welding jobs, and adjustment necessary to suit your individuality and the welding job.



DUAL CONTINUOUS CONTROL

in a rectifier welder. Can vary the current from minimum to maximum, and vary the type of arc, with continuous stepless self-indicating dials.

*TRADEMARK

Even in those tight, cramped places, where there's hardly room to turn around, this handy little remote control box goes right with you. No matter what your welding position, you can "dial" the exact arc you need, without running back to the welder to change range switches and taps. Only the Vickers CONTROLARC gives you this individual control of current and type of arc in convenient remote control operation.

AND ONLY THE CONTROLARC GIVES YOU THESE EXCLUSIVE OPTIONAL FEATURES

Constant Potential (CP) Adaptor • Slope Controller

WRITE TODAY

for more information on this versatile welder.

DESIGN ENGINEERS:

There are openings in our expanding program. Write for details.

VICKERS ELECTRIC DIVISION

VICKERS INCORPORATED a unit of Sperry Rand Corporation

1851 LOCUST STREET • SAINT LOUIS 3, MISSOURI

The product behind the most revolutionary welding rod development in recent years.

Foote
RZ-40
IRON POWDER

The unprecedented acceptance and use of iron powder welding electrodes stems from higher deposition rates, good slag removal characteristics and welding ease. Foote RZ-40 Iron Powder is the predominant coating ingredient in most of these welding rods.

Noted for its high purity, Foote RZ-40 Iron Powder is an atomized material. This assures more uniform physical and chemical properties which facilitate the manufacture and use of welding electrodes.

FOOTE RZ-40 IRON POWDER

Chemical Analysis

	Min.-Max. Range	Typical
Total Fe	97% Min.	98.23%
Metallic Fe	94% Min.	96.21%
Loss in Hydrogen	2.0% Max.	1.25%
C	.08% Max.	.06%
S	.025% Max.	.02%
P	.02% Max.	.015%

Screen Analysis

30 x 200 mesh: 100% thru 30 mesh
98% min. thru 40 mesh
45% approx. thru 100 mesh
25% max. thru 200 mesh

Foote RZ-40 Iron Powder is just one of 27 specialized chemicals, minerals and ferroalloys produced by Foote—the leading supplier of welding rod coating materials for more than three decades.

Write for further information

Foote
MINERAL COMPANY

453 Eighteen West Chelten Building,
Philadelphia 44, Pa.

RESEARCH LABORATORIES: Berwyn, Pa.

PLANTS: Exton, Pa.; Kings Mountain, N.C., Knoxville, Tenn.; Sunbright, Va.

FLAME-cutting and cement mixing require use of both containers.

Trailer has welded design and dual role

TO OFFSET difficulties arising from the simultaneous transportation of solids and liquids, M. F. Robertshaw Ltd., Buckinghamshire, England, recently designed a dual-purpose two-wheel tank trailer of all-welded construction.

This transport problem previously was tackled by using two vehicles—a tank trailer to move the liquid, and another to carry dry goods.

The Robertshaw tank trailer, manufactured in three models, can accommodate up to 200 gal of liquid in the lower part of its chassis because the capacity of its freight section is reduced by a few per cent over that of a conventional trailer of similar size.

Transverse Baffles

Since there is normally a waste of space in the average trailer chassis, the reduction effected by Robertshaw is actually negligible.

The all-welded steel vehicle consists of one longitudinal central spine member and three transverse baffles. Mild steel sheets, 1/16 in. thick, used in fabrication are formed by hydraulic presses after normal piercing operations.

Power for welding is supplied by d-c motor-generators. Manual arc welding with 3/32-in. all-position electrodes is generally used; however, an automatic resistance welding process is used for timed spot welding on reinforcing rails.

The parts to be welded are placed on a work positioner and held by air clamps. Welds usually are butted. After this joining operation, the

THE WELDING

Distributor

A NEW PUBLICATION

Welding Engineer Publications, Inc., will begin publication of the welding industry's FIRST merchandising magazine on a bi-monthly basis with the March, 1957, issue.

On Feb. 20, 1957, over 5,000 copies will be mailed to distributors of welding equipment and supplies to industry in answer to their request for a publication devoted exclusively to their problems.

Manufacturers and distributors agree on the value of THE WELDING DISTRIBUTOR. Here are some comments on the March pilot issue:

An advertiser says,

"It might interest you to know that we received 66 inquiries from our ad in your WELDING DISTRIBUTOR. Of that number, 15 new distributors have been appointed . . . ."

A reader says,

"This is just the type of editorial material we need and want. Please enter a subscription for myself and our 11 salesmen listed below . . . ."

THE WELDING DISTRIBUTOR is an effective means for you to present your *confidential* sales message to the welding supply distributor and re-seller.

MAKE YOUR PLANS EARLY . . . .

CLOSING DATE FOR THE MARCH ISSUE IS FEBRUARY 1.

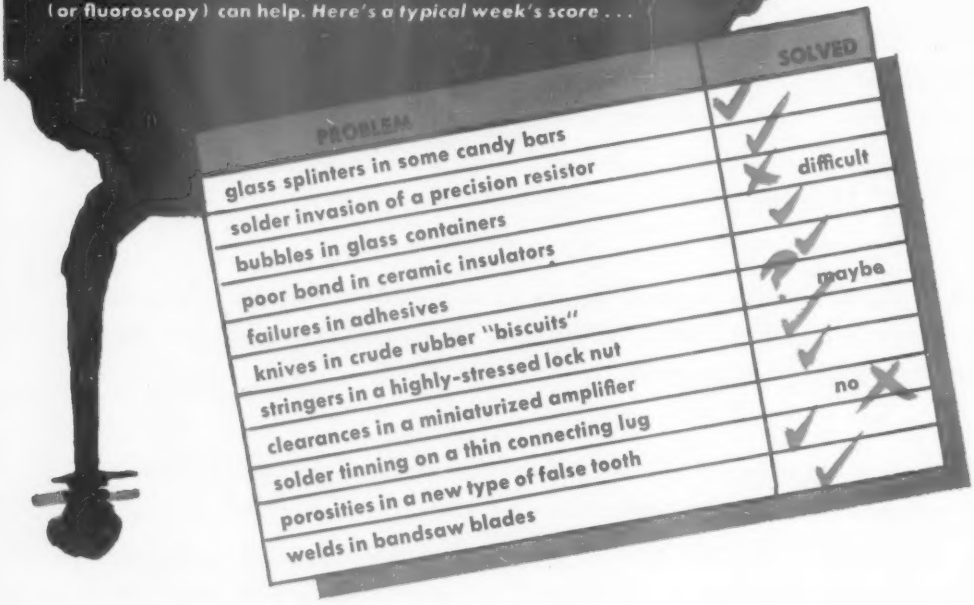
In THE WELDING DISTRIBUTOR, you can talk price discounts, recruit dealerships, promote product values, support distributor programs, explain sales policies . . . you can merchandise your product effectively.

Subjects that are difficult to handle in consumer-aimed advertising can be discussed in this publication.

Plan now to use both WELDING ENGINEER and THE WELDING DISTRIBUTOR in your 1957 selling campaign.

HIDDEN flaws in your products need detecting?

Every day brings new inspection problems to Picker for possible solution. More often than not, radiography (or fluoroscopy) can help. *Here's a typical week's score . . .*


PROBLEM
SOLVED
glass splinters in some candy bars
solder invasion of a precision resistor
difficult
bubbles in glass containers
poor bond in ceramic insulators
failures in adhesives
maybe
knives in crude rubber "biscuits"
stringers in a highly-stressed lock nut
clearances in a miniaturized amplifier
no
solder tinning on a thin connecting lug
porosities in a new type of false tooth
welds in bandsaw blades

Makes no difference *what* you make or buy or sell . . . if it needs "seeing into" for quality control, radiography (gamma or x-ray) can probably profit you.

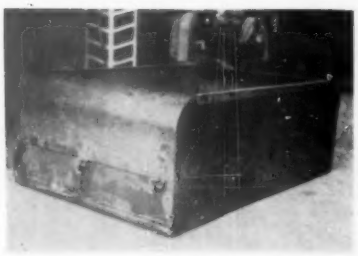
Talk it over with your local Picker representative * or write us outlining your problem and, if possible, sending typical samples. We'll make tests and tell you frankly whether radiography holds any promise for you. *Costs you nothing to find out . . . maybe it's costing you a great deal right now NOT TO.*

* *There's probably a Picker district office near you (see local 'phone book).*

Picker x-ray

PICKER X-RAY CORPORATION
25 South Broadway, White Plains, N. Y.

Picker... your one Source for Everything in Radiography and Fluoroscopy



CHASSIS of dual-purpose tank trailer following welding.

trailer's body is removed by means of an air-operated hoist, inverted, and placed on another positioner.

16 Welded Points

The body is then filled with a penetrating fluid under 1½ psi pressure. If the fluid indicates any leaks, they are immediately rewelded.

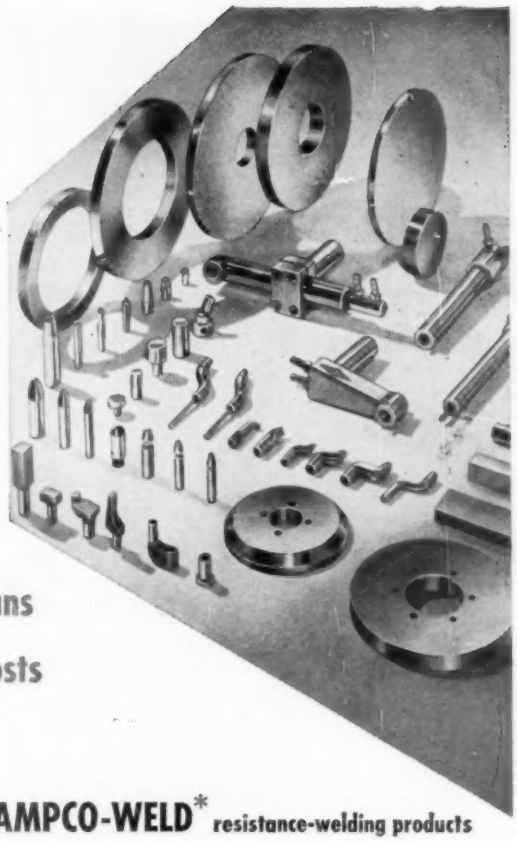
When completed, the standard model is 9-1/3 ft long (including tow bar), approximately 6 ft wide (including tool boxes), and 3-1/3 ft high. Its total weight is 850 lb.

For shipping, wheels and axle assembly, tool boxes and tow bar with automatic hitch and jockey wheel are fitted within the trailer's body. When disassembled for shipping the unit is 6 ft long, 4 ft wide, and approximately 2 ft high. It has 16 welded points for assembly at its destination.

The dual-purpose vehicles can be used to carry a contractor's fuel and equipment to a job site; fodder and drink for cattle, or water and cement to make concrete. Because it is watertight, the trailer can also be used wherever an amphibious vehicle would be of service.

"THE LAST WELDOR WE HAD WAS A WOMAN; --ARE YOU SURE YOU CAN FILL HER SHOES?"

You've Got What It Takes



for longer runs and lower costs

...when you use AMPCO-WELD* resistance-welding products

Every item in the complete Ampco-Weld line is manufactured under strict laboratory control to give you longer runs and lower costs.

AMPCO-WELD spot-welding tips — stay cooler — won't stick to the work . . . tough — resist mushrooming and wear . . . fewer dressings needed — they last longer, cost less.

AMPCO-WELD rod — is available from stock — either in rounds, including hex, or in square and rectangular bars. There's a size for every need — all feature Ampco toughness and high electrical conductivity.

AMPCO-WELD seam-welding wheels — many users report 150% longer life. Resist wear — even at elevated temperatures. High electrical conductivity. Get them on short notice as rough forgings, finished blanks, or fully machined.

AMPCO-WELD resistance-welding holders — to suit every job — straight, offset, and universal ejector models. Offset and universal holders have interchangeable sockets for No. 1 and No. 2 Morse tapers. You change tapers without changing holders.

All Ampco-Weld resistance-welding products meet or exceed RWMA specifications. Experienced engineering service is also available. Get what it takes to lower your resistance-welding costs — get Ampco-Weld, the best value for your resistance-welding dollar.

RW-15

AMPCO®

Sole producer of genuine Ampco Metal

AMPCO METAL, INC.
Dept. WE-12
Main Office and Plant • Milwaukee 46, Wis.
West Coast Plant • Burbank, California

*Reg. U. S. Pat. Off.

TESTING wire-feed speed, operator boosts CO_2-shielded Mig welder to 500-ipm output.

Automatic welders are "proved out" by positioner firm

By a Staff Member

SERVING as a proving grounds for automatic welding applications is an added function of C. B. Herrick Mfg. Corp.

This Cleveland manufacturer of ram-type welding head manipulators offers its shop facilities to makers of companion automatic equipment for demonstrating their wares.

During the week of the recent Metal Show, Herrick had three different automatic set-ups to show visitors to its open house. Actually, these heads and control equipment had been placed there in order that each of three manufacturers might demonstrate to some customer or prospect a special automatic welding application.

Both submerged-arc and gas-shielded applications are usually evident. For example, a recent application saw the use of an automatic submerged-arc welding head (in conjunction with a Herrick manipulator) feeding build-up wire onto bearing holders. A steel mill wanted to find out whether they were salvagable.

On this job, Herrick used a d-c motor-generator welder at 600 amp and 40 volts. Wire-feed was held at 6 to 8 in. per minute—the slow speed was employed to attain a wide bead. Build-up wire was 7/32 in. in diameter.

In direct contrast to this slow wire-feed speed, a carbon-dioxide-shielded set-up was pouring wire out at the rate of 500 ipm. Power source was also an m-g set, but one of different manufacture. Current was 250 amp at 18 volts.

Another automatic CO_2 application found two wheel hubs being joined at 550-600 amp and 36 volts. Welding speed was 30 ipm. Electrode was a mild-steel, copper-coated wire, 1/16 in. in diameter.

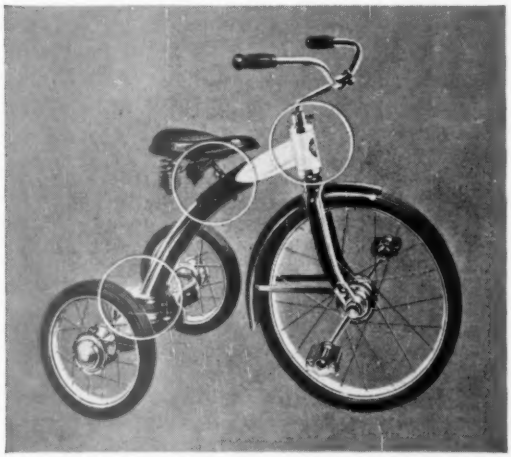
SUBMERGED-ARC set-up was used to build up bearing holders for steel mill.

CO_2 SHIELD is employed in joining wheel hubs at a speed of 30 ipm.

The sturdy Taylor Velocipede frame of 2-inch mild steel tubing is braze-welded on this fixture, with ⅛-inch Anaconda-997 (Low Fuming) Bronze Welding Rod, using the oxyacetylene flame-fluxing process.

"...quickest, most dependable, most economical..."

"Braze Welding with Anaconda 997 (Low Fuming) Bronze Welding Rod is the most practical method of joining steel tubing," The Frank F. Taylor Co.



The strategically placed braze welds on Taylor Velocipedes have smooth contours, a good basis for a fine finish—and high strength to stand up in the hardest service. The Frank F. Taylor Co. also makes the famous Taylor-Tot, standard equipment in most young families.

"By depositing smooth flowing and low fuming weld metal, Anaconda-997 (Low Fuming) Bronze Welding Rods promote faster, more uniform work—providing the quickest, most dependable, most economical method of joining steel tubing," says The Frank F. Taylor Company of Norwood, Ohio.

Anaconda 997 (Low Fuming) Bronze is a superior braze-welding rod widely used for the joining of steel, cast iron, and copper alloys by the oxyacetylene process. It is also used to deposit bearing surfaces on steel and iron. Anaconda Welding Rods are sold by distributors of welding equipment everywhere, such as O.K.I. Welding Company, Cincinnati, Ohio, which supplies The Frank F. Taylor Company.

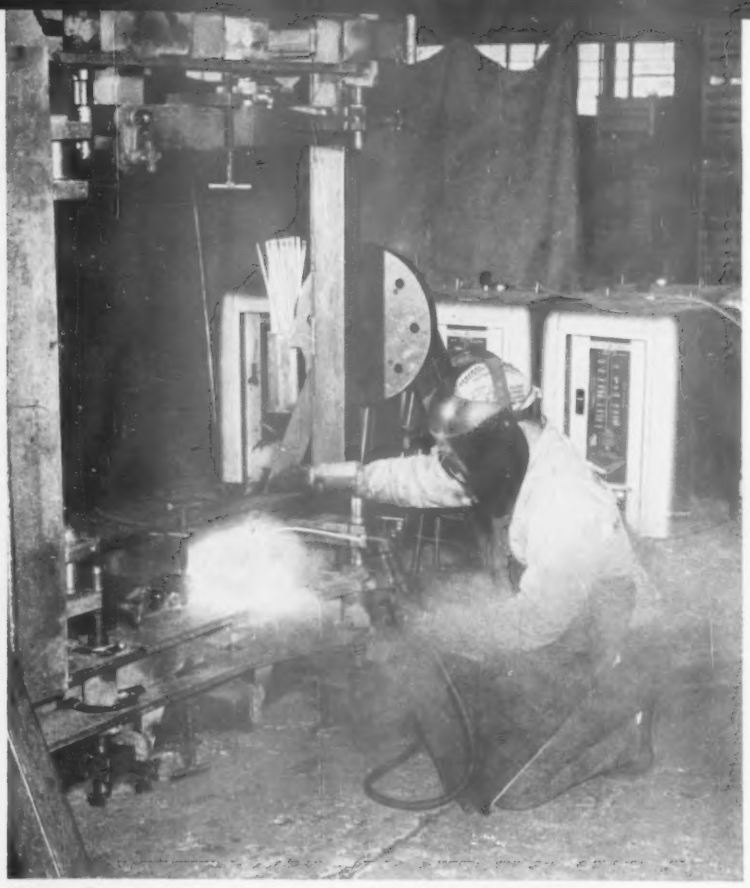
See your Anaconda distributor for help in selecting the exact rod for your job. Or write for Publication B-13. Address: The American Brass Company, Waterbury 20, Conn. In Canada: Anaconda American Brass Company Ltd., New Toronto, Ont.

56108

ANACONDA® WELDING RODS

CONSTRUCTION MACHINERY

Why Clark a-c arc



Using a General Electric a-c arc welder, Alvis Kirk of Clark Equipment Co. welds the hinge plate of a bucket-carrier assembly for a Michigan tractor shovel. Though made for heavy duty, the assembly must be built to a tolerance of $\pm \frac{1}{16}$ inch.

T. E. LYONS, assistant purchasing agent

. . . on a tough

This clean, sturdy weld, made in a difficult position, binds one of 10 bosses to the hinge plate. The General Electric a-c arc welders easily handle the tough job of welding the plate of hard steel without undercutting the mild-steel boss.

Finished product, the Michigan model 175-A tractor shovel, loads a bin car. In manufacturing this shovel and other heavy-duty machinery at the Pipestone Plant, Clark uses G-E a-c welders.

At Clark Equipment Company's modern Pipestone Plant in Benton Harbor, Mich., more than 20 General Electric a-c arc welders are used to weld the Michigan line of tractor shovels and other heavy-duty construction machinery.

This demanding welding job calls for sturdy, stress-carrying welds made to close tolerances. Several difficult positions and many different kinds of steel complicate things further. Why this job was turned over to General Electric a-c welders is explained by four members of Clark's production team:

Alvis Kirk, welding operator—"I like the General Electric a-c arc welder because it's always ready to go. I like the quick-shift range feature which

DIVISION OFFICIALS TELL YOU . . .

Equipment Company uses General Electric welders in building heavy-duty shovels

JACK G. PAUL, welding engineer

NICK J. WHITE, superintendent of maintenance

welding job, G-E a-c welders prove versatile, reliable, economical

allows it to go from high to low current or the reverse, and it's very good about holding an even heat. I must weld vertical-up, vertical-down, and other difficult positions, but I never have any trouble holding a steady arc."

Jack G. Paul, welding engineer—"With the General Electric a-c arc welder there is no arc blow to bother with. Arc striking is instant, and the stepless current control and logarithmic scale give a very fine setting. The large scale in front of the welder enables the operator to see the setting from a distance without leaving his work. And the 'Hi-Lo' range switch quickly adapts the machine to many different applications. The current adjustor on top makes it easy for the operator to set current. In our shop we need machines that keep downtime to a minimum, and General Electric a-c welders meet this requirement."

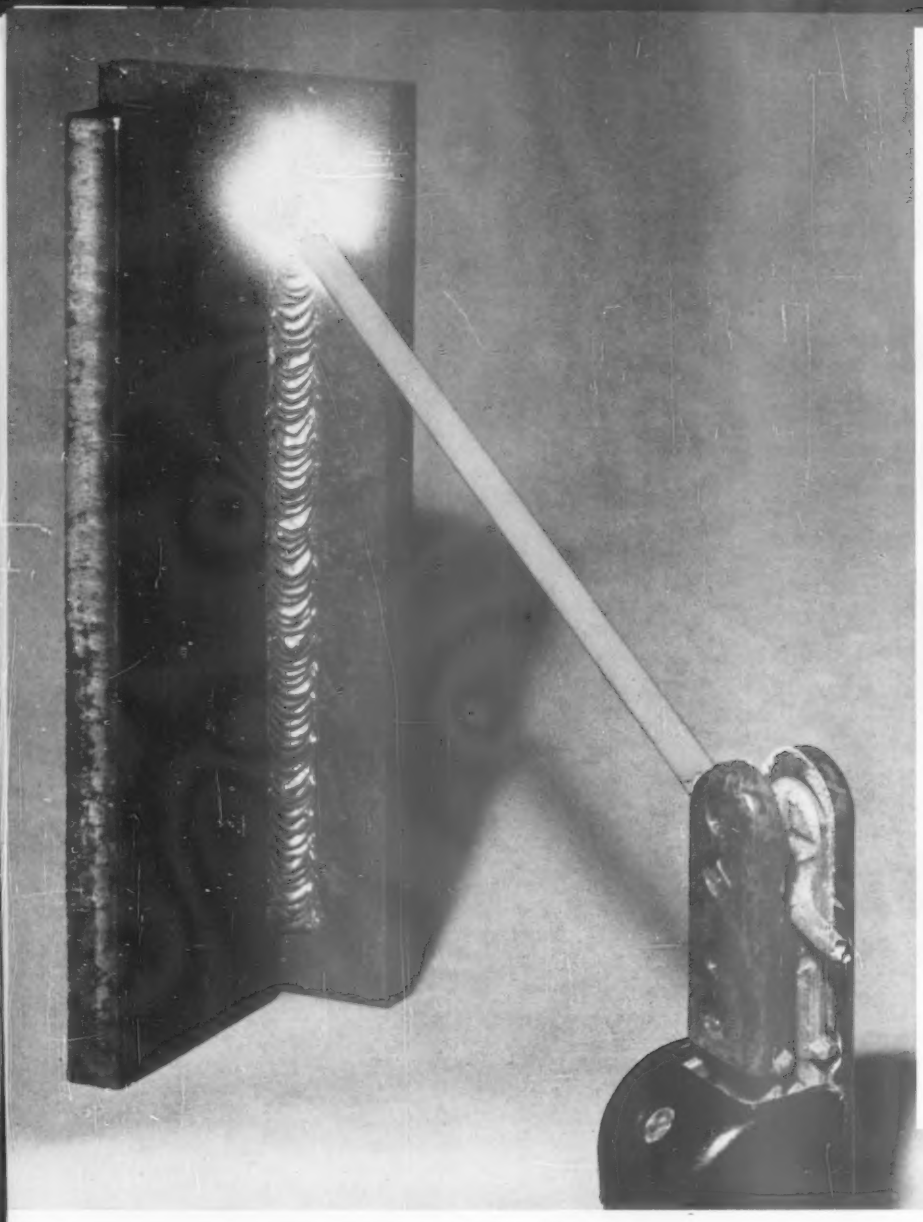
T. E. Lyons, assistant purchasing agent—"I like the General Electric a-c welder because of its ready acceptance by our plant engineers and welding operators. Its price is competitive, and the engineering assistance given by General Electric in applying the welders to solve our various welding problems is invaluable. Delivery of spare and repair parts is excellent."

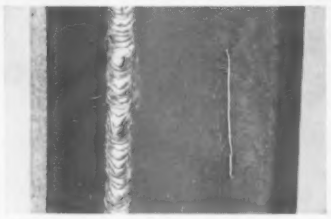
Nick J. White, superintendent of maintenance—"The General Electric a-c arc welder is simple to take apart. We blow out the machines every three months and have had no service difficulties with any of our 20 500-amp machines during the past two years. And, if needed, replacement parts are available on short notice. The electrical switchgear is rigid and heavily built, and the machine has a good ventilation system. Method of power-factor correction on these machines helps us maintain an over-all plant power factor of 88 per cent."

The Pipestone Plant is only one of many users for whom General Electric a-c arc welders have shown their value for heavy-section, high-current welding. If you would like more information on General Electric a-c arc welders, contact your nearby General Electric welding distributor (listed in the yellow pages of your phone book), or write for bulletin GEA-6243A to Section 711-6, General Electric Company, Schenectady 5, N. Y.

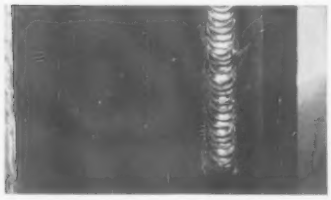
Progress Is Our Most Important Product

GENERAL ELECTRIC

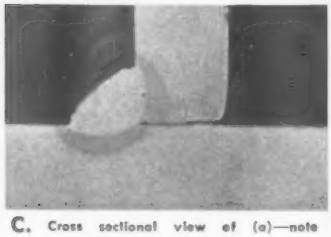




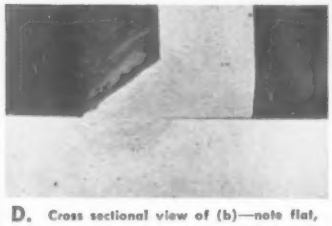
A. Fillet weld using conventional E-6010 Electrode—vertical-up position.



B. Fillet weld using General Electric Strikeasy 610—vertical-up position. Note smoother, more even ripple.



C. Cross sectional view of (a)—note wagon tracks along edges.



D. Cross sectional view of (b)—note flat, even bead—wagon tracks eliminated; no areas for slag entrapment.

NEW IRON-POWDER E-6010 ELECTRODE PRODUCES BETTER WELDS IN ALL POSITIONS

IT'S GENERAL ELECTRIC'S NEW STRIKEASY 610

An E-6010 electrode with an iron-powder coating is now available in General Electric's new all-position Strikeasy 610.

It features:

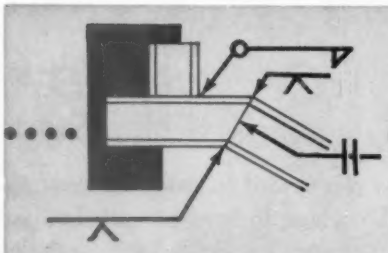
- Outstanding flexibility, ease of use, and greater deposition rate.
- Excellent wetting action allowing quick and easy whipping technique with greater speed and reduced "wagon tracks."
- Maintains shielding to the full usable length of the electrode.
- Superior bead shape improves ductility, (26% in 2 inches), simplifies slag removal, and improves appearance.

A few of its many applications include tanks, pipe line, steel casting repair, galvanized plates, and ship fabrications.

For more information contact your nearest General Electric welding distributor, or write Section 715-4, General Electric Company, Schenectady, New York.

Progress Is Our Most Important Product

GENERAL ELECTRIC



the welding clinic

Here you may find the solution to your welding problems, whether they concern design, production, construction or maintenance welding. Submit your questions for answering on this page.

Welding carbide tips to tool steel

Question:

Could you give me a few tips on welding carbide to tool steel? I am planning to attach a carbide tip onto a steel cutting tool, and would like to know the proper procedure to follow. Does the tip need any special support? I have some oxyacetylene welding equipment which I hope to use in getting the job done.

Answer:

Silver brazing is the most satisfactory method for attaching carbide tips to tool steel. You must remember, however, that carbide tips have no particular strength and must be backed up with a steel bar or some other similar material.

There are a number of important steps involved, the first of which is cleaning the tip's surface and the backup bar by either chemical or mechanical means.

Make certain that all joint surfaces are close-fitting. Then, coat all joint surfaces liberally with a silver-brazing flux.

Brazing alloys can now be applied. A thin sheet insert may be used. The recommended practice, however, is to apply the alloy by tinning all recessed surfaces of the carbon steel shank with wire.

Carbide Tip Heated

This is done by heating the underside of the shank to about 1,200 F with an oxyacetylene torch. Allow the wire to flow into the recessed surface of the shank.

The fluxed carbide tip should be placed in position while the shank is hot. Since this tip is cool, it will undoubtedly chill and solidify the brazing alloy. Therefore, the torch should again be brought into play.

The torch flame should be directed on the underside of the shank so that heat will soak through it and heat the carbide tip by conduction.

Proper brazing temperature is reached when the tool tip slides around easily on the film of molten brazing alloy.

Allow the alloy to solidify, holding the tip in place under light pressure by means of a tong or steel rod. The tool is now ready to be ground for use.

Question:

Our firm recently bought a Tig welding machine, and I have experienced difficulty in welding thin-gage aluminum. Could I have information on the best type and thickness of aluminum on which to practice; on the use of backup bars with thin-gage aluminum, and on health hazards involved in using the process? I would appreciate any other information which would help me.

Answer:

The firm from which you purchased the Tig welder can furnish you with instruction books and other literature on operation of the machine. Any good welding school in your neighborhood can undoubtedly help solve your particular problems.

The best thickness of aluminum to be used for practice is the same type and thickness with which you are going to work. If the material is extremely thin, however, try your practice welds on sheets approximately 1/16 in. thick.

You should learn to weld aluminum and other metals of this thickness without backup bars. The following should be of some help to you.

A filler rod may or may not be used. When it is employed, the method of feeding rod is usually at an angle of 20 to 30 deg from the horizontal.

The rod is fed in short jabs into the very front edge of the pool. The arc is drawn back slightly with each rod application to prevent it from playing directly on the end of the filler rod.

Eye Protection

Never add filler metal continuously. Avoid any addition until the weld pool is bright and has progressed sufficiently ahead of the tungsten electrode to permit metal to be added without danger of inserting it into the arc.

The weld bead's surface should be bright, with smooth, evenly-spaced convolutions. The penetration side should be light gray in color and should not show a center crevice; this latter condition may indicate either insufficient welding heat or improperly cleaned edges.

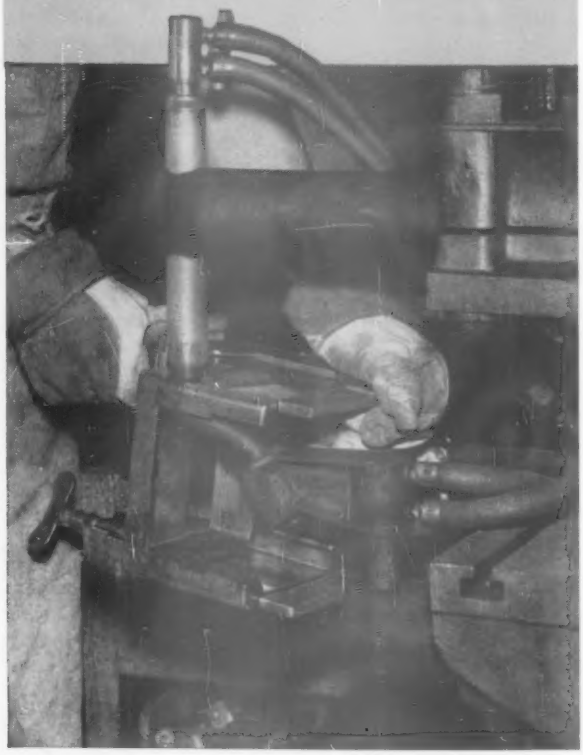
Dangers to health when welding with the Tig process are nonexistent if the eyes are shielded with suitable lenses and clothing is suitable to protect the body from ultra-violet arc rays.

Any arc welding process will cause sunburn symptoms and sore eyes unless skin and eyes are adequately protected.

Linde Air Products Co., Air Reduction Sales Co., and General Electric Co. have prepared films dealing with Tig welding. Representatives of these companies, or their district sales offices, would be happy to provide you with such films for educational purposes.

Welding Output Increased

on Western Electric Coin Box Production



In Canada, made and sold by Johnson Matthey and Mallory, Ltd., 110 Industry Street, Toronto 15, Ontario

Suppose you needed to spot-weld sheet steel to steel forgings, in hard-to-reach locations. Western Electric's plant at Indianapolis had this problem on telephone coin boxes. Custom-designed electrodes and holders had seemed the way to do the job.

But, since using a standard Mallory heavy-duty offset holder and Mallory bent tips, their welding costs have been reduced and production rate has been increased.

Output increased. The number of parts welded per shift has been increased significantly. Reason: less tip dressing, less setup time loss, cooler operation and minimum respotting.

Longer electrode life. Replacement rate is now less. Reason: better cooling of electrodes . . . all the way to the tip.

Less down time. Re-dressing is now needed only once per shift.

Chances are that you, too, can make substantial savings in resistance welding production, by using Mallory electrodes, holders, seam welding wheels, dies, castings and forgings . . . and by taking advantage of Mallory engineering service in applying these products effectively to your problem. See your local Mallory welding distributor for prompt service, and write to us for our resistance welding catalog.

Expect more . . . Get more from

P. R. MALLORY & CO. Inc.

MALLORY

P. R. MALLORY & CO., Inc., INDIANAPOLIS 6, INDIANA

Serving Industry with These Products:

Electromechanical—Resistors • Switches • Tuning Devices • Vibrators
Electrochemical—Capacitors • Rectifiers • Mercury Batteries
Metallurgical—Contacts • Special Metals • Welding Materials

For information on titanium developments, contact Mallory-Sharon Titanium Corp., Niles, Ohio

Corrosion resistance of copper and copper-base alloys—Part III

(See Parts I & II, **Classification** and **Selection,** in WELDING ENGINEER for July, p. 69, and August, p. 53)

Standard Commercial Wrought Copper and Copper-base Alloys	*Atmosphere*			*Water*		*Alcohol*	*Fuel Oil*	*Gasoline*	*Natural Gas*	*Sewage*	*Steam*
	Industrial	*Marine*	*Rural*	*Potable*	*Sea*						
ELECTROLYTIC TOUGH PITCH COPPER	1	1	1	1	2	1	1	1	2	1	1
DEOXIDIZED COPPER	1	1	1	1	2	1	1	1	2	1	1
OXYGEN-FREE COPPER	1	1	1	1	2	1	1	1	2	1	1
GILDING, 95%	1	1	1	1	2	1	1	1	2	1	1
COMMERCIAL BRONZE, 90%	1	1	1	1	2	1	1	1	1	1	1
RED BRASS, 85%	1	1	1	1	2	1	1	1	1	1	1
JEWELRY BRONZE, 87.5%	2	2	1	3	3	1	2	1	1	3	3
LOW BRASS, 80%	2	2	1	3	3	1	2	1	1	3	3
CARTRIDGE BRASS, 70%	2	2	1	3	3	1	2	1	1	3	3
YELLOW BRASS	2	2	1	3	3	1	2	1	1	3	3
MUNTZ METAL	2	2	1	3	3	1	2	1	1	3	3
LEADED COMMERCIAL BRONZE	1	1	1	1	2	1	1	1	1	1	1
LOW-LEADED BRASS (TUBE)	2	2	1	3	3	1	2	1	1	3	3
LOW-LEADED BRASS	2	2	1	3	3	1	2	1	1	3	3
MEDIUM-LEADED BRASS	2	2	1	3	3	1	2	1	1	3	3
HIGH-LEADED BRASS (TUBE)	2	2	1	3	3	1	2	1	1	3	3
HIGH-LEADED BRASS	2	2	1	3	3	1	2	1	1	3	3
EXTRA-HIGH-LEADED BRASS	2	2	1	3	3	1	2	1	1	3	3
FREE-CUTTING BRASS	2	2	1	3	3	1	2	1	1	3	3
LEADED MUNTZ METAL	2	2	1	3	3	1	2	1	1	3	3
FREE-CUTTING MUNTZ METAL	2	2	1	3	3	1	2	1	1	3	3
FORGING BRASS	2	2	1	3	3	1	2	1	1	3	3
ARCHITECTURAL BRONZE	2	2	1	3	3	1	2	1	1	3	3
INHIBITED ADMIRALTY	1	1	1	1	1	1	1	1	1	1	1
NAVAL BRASS	2	2	1	3	2	1	2	1	1	2	1
LEADED NAVAL BRASS	2	2	1	3	2	1	2	1	1	2	1
MANGANESE BRONZE, (A)	2	2	1	3	2	1	2	1	1	2	1
ALUMINUM BRASS	1	1	1	1	1	1	1	1	1	1	1
PHOSPHOR BRONZE, 5% (A)	1	1	1	1	2	1	1	1	1	1	1
PHOSPHOR BRONZE, 8% (C)	1	1	1	1	1	1	1	1	1	1	1
PHOSPHOR BRONZE, 10% (D)	1	1	1	1	1	1	1	1	1	1	1
PHOSPHOR BRONZE, 1.25% (E)	1	1	1	1	2	1	1	1	2	1	1
FREE-CUTTING PHOSPHOR BRONZE	1	1	1	1	2	1	1	1	1	1	1
CUPRO-NICKEL, 30%	1	1	1	1	1	1	1	1	1	1	1
CUPRO-NICKEL, 10%	1	1	1	1	1	1	1	1	1	1	1
NICKEL SILVER, 65-18	1	1	1	1	1	1	1	1	1	1	1
NICKEL SILVER, 55-18*	1	1	1	1	1	1	1	1	1	1	1
NICKEL SILVER, 65-15*	1	1	1	1	1	1	1	1	1	1	1
NICKEL SILVER, 65-12*	1	1	1	1	1	1	1	1	1	1	1
NICKEL SILVER, 65-10*	1	1	1	1	1	1	1	1	1	1	1
HIGH-SILICON BRONZE, (A)	1	1	1	1	2	1	1	1	1	1	2
LOW-SILICON BRONZE, (B)	1	1	1	1	2	1	1	1	1	1	2

*Slightly less corrosion resistant than nickel silver, 65-18

Ratings: 1—Excellent corrosion resistance
2—Good corrosion resistance
3—Fair corrosion resistance

—Courtesy Copper & Brass Research Ass'n.

What about C-OMANUAL ?

It's a complete, integrated package for gas-shielded (CO_2) semi-automatic hand gun welding.

Introduced to production early in 1956, C-OMANUAL is A. O. Smith's answer to the need for a fast, economical and easy-to-use semi-automatic welding process. It incorporates a new featherweight hand gun, portable control console and an A. O. Smith power source. The entire compact package requires only a few square feet of space and is perfectly adapted to an extremely wide range of production or special job requirements.

Already proving itself in plants throughout the U. S., C-OMANUAL is the most talked-about, most important welding development since the coated electrode. And the principles of CO_2 shielding have been more than adequately proved by C-OMATIC, the A. O. Smith automatic welding process.

Reporter observes typical C-OMANUAL installations as operator explains ease of hand gun manipulation featuring visible arc and automatic arc length control.

It's EXTREMELY EASY to set up, use and operate... makes changing wire sizes a breeze.

With C-OMANUAL, the welder merely sets the proper current on the rectifier, pushes a start button for power. The hand gun automatically compensates for arc distance variations, and the portable control console is right at hand for fine adjustments. There's no flux to clean, no slag to remove. And the visible arc lets the welder see his work at all times.

WIRE: A. O. Smith has developed wires that will make sound, strong welds on all commercial steels currently in use—rim, semi-killed or killed. The characteristics of the wire include tolerance for the presence of oils, lubricants, scale, foreign material, etc.

The console features easy-to-read, conveniently grouped controls. Large, easy-opening doors swing out for fast, simple wire reel changing. In demonstrations at various welding shows, welders were making highly satisfactory welds the first time they used the C-OMANUAL process.

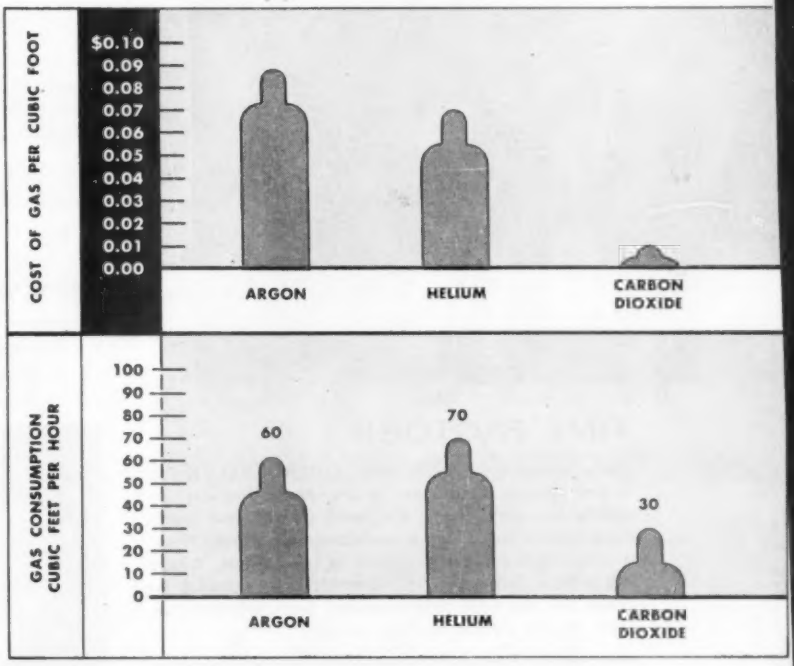
Carbon dioxide is the most efficient, economical of all shielding gases.

Lab tests, confirmed by numerous users, indicate radiographically sound welds with mechanical properties equal to the best produced by coated electrodes or by any other welding process. Tests were conducted on single, double and multi-pass butt welds . . . longitudinal, circumferential, positioned fillets and on plug and 3 o'clock welds. All were completely satisfactory.

And, as you can see in the charts at right, C-OMANUAL saves thousands of dollars annually over other shielding gases.

NOTE: On the following pages CO_2 welding is compared with hand electrodes and semi-automatic submerged arc. The charts above make it apparent that the high costs of Argon and Helium eliminate them from serious consideration for mild steel applications.

The C-OMANUAL wire feed driving mechanism is contained in the console and is easily accessible. The changing of wire reels and unit inspection is extremely simple. 60-lb. coils of any diameter are self-contained in the console. Special provision for economy "pay-off" packs can be made for large users.



Charts show comparative cost per cubic foot and relative consumption rates of Argon, Helium and Carbon Dioxide. Prices are based on standard-size cylinders. For users who'll want to use C-OMANUAL extensively, CO_2 in liquid form can be purchased in bulk storage tanks, converted to gas and piped into the job for less than half a cent per cubic foot.

SEE FOLLOWING PAGES FOR TIME AND COST COMPARISONS

A. O. SMITH CORPORATION, Milwaukee 1, Wisconsin

How C-OMANUAL three other

whatever your means of measuring welding costs, C-OMANUAL comes out on top

To spotlight the tremendous advantages offered by C-OMANUAL, A. O. Smith ran tests against submerged-arc (semi-automatic) process and the two types of stick electrodes usually used for jobs of this type. Box at right gives set-up information on tests. Data pertaining to "manual submerged-arc" in all following charts was compiled from manufacturers' operation manuals.

SET-UP DETAILS ON IDENTICAL ¼", 100-FT FILLET WELDS				
	E-6013	E-6024	Manual Submerged-Arc	C-OMANUAL
Electrode	1/4"	7/32"	5/64"	1/16" CO-86
Amps*	320	250	350	520/530
Volts	22/23	23/24	32	40/41
Polarity	a-c	a-c	Reverse (+)	Reverse (+)

*Detailed explanation of amp variations involves the lengthy theory of C-OMANUAL's High Current Density method. It suffices here to say amps tabulated are estimated as normal ratings for the various process on this particular job.

TRAVEL SPEEDS AND METAL DEPOSIT RATES

In addition to inherent speed, C-OMANUAL gives the operator a visible arc. He can fully utilize its high speed and fast metal deposit because he just pulls the trigger, follows the joint until the weld's complete. There's no need for stops to check his progress, no interruption when he moves from pass to pass.

Chart I

	E-6013	E-6024	Manual Submerged-Arc	C-OMANUAL
Travel Speed (ipm)	12.5	18.5	21.4	40.0
Deposit Rate (lbs/hr)	6.65	9.81	11.4	21.0

C-OMANUAL is 84% to 220% faster . . . deposits 87% to 216% more metal per hour than other processes

TIME FACTORS

Four factors combine to make C-OMANUAL the fastest process in its class. First, set-up and current setting are easy. Next, the hand gun automatically compensates for distance variations, eliminates time-wasting trial-and-error as well as false starts. Working with a visible arc, the operator need not stop to check how the weld is progressing. Last, but far from least, there's no slag to chip, no flux.

Chart II

Time (hrs.)	E-6013	E-6024	Manual Submerged-Arc	C-OMANUAL
Arc	1.590	1.080	0.930	0.500
Electrode Change	.075	.066	—	—
Slag Removal	.130	.084	0.120	—
Total	1.795 (1 hr, 40 min)	1.230 (1 hr, 15 min)	1.050 (1 hr, 3 min)	0.500 (30 min)

C-OMANUAL completes 100-ft weld 110% to 259% faster than other processes

stacks up against welding processes

COST FACTORS

The figures in the chart below have been compiled on the basis of the tabulations in charts I and II. All cost figures are based on an *exact* (by weight) ¼" fillet 100 ft in length. It's interesting to note that if the "overhead" or burden figure were increased, the advantage in favor of C-OMANUAL would become even more pronounced.

Chart III

Cost	E-6013	E-6024	Manual Submerged-Arc	C-OMANUAL
Labor @ $2.50/hr	4.49	3.08	2.63	1.25
Overhead @ 150%	6.74	4.62	3.95	1.88
Power @ .01/kwh	.14	.08	.17	.17
Flux	—	—	1.43	—
Gas (CO_2) @ .01/ft³	—	—	—	.15
Electrodes or Wire	2.09	2.86	1.38	3.09
Total	$13.46	$10.64	$9.56	$6.54

RESULT— based on charts I, II and III **...C-OMANUAL**

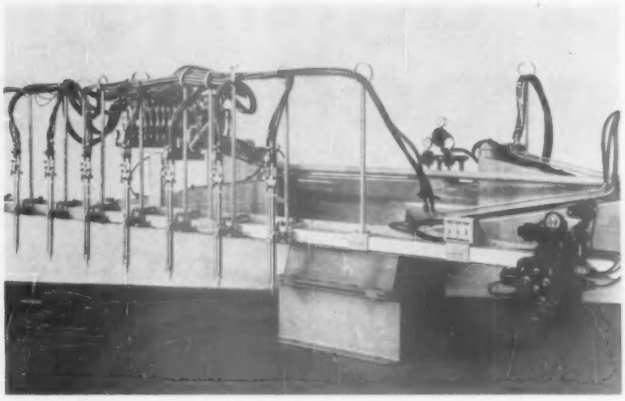
cuts total welding cost per 100 feet by 31% to 51%!

If you'd like to know more about C-OMANUAL, get graphic proof how it can greatly improve your present set-up, cut costs, win favor with welders, too, write direct for comprehensive details. Please describe, briefly, the type of work you're currently handling or planning to do. Address inquiries to A. O. SMITH, WELDING PRODUCTS DIVISION.

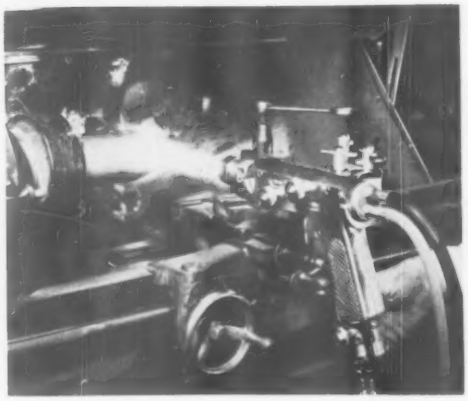
Through research ... *a better way*

A.O.Smith
CORPORATION
WELDING PRODUCTS DIVISION
MILWAUKEE 1, WISCONSIN
International Division: Milwaukee 1, Wisconsin

new products . . . . . USE CARD ON PAGE 107



DESIGNED to carry automatic flame-cutting equipment, machine can also carry automatic electronic welding equipment.



WITH this hardfacing unit, metal powders are sprayed at high rate, then fusion-bonded to part by heating with oxyacetylene flame.

Flame-cutting

MEDIUM area oxyacetylene shape-cutting machine is termed "Airco No. 56 Oxygraph." Machine is designed to carry the latest automatic cutting equipment—motorized cutting torch holders, solenoid gas distribution system, and electronic tracer—remotely controlled from operator's station.

Of the stationary type with fixed cutting area (56 in. diameter circle), machine can be converted to larger area, unlimited length machine by addition of rails and traveling carriage. Electronic, manual and magnetic tracers may be used. Unit consists of pantograph arms, operating bar on which torches and tracer are mounted; welded pedestal for bolting to floor.

Other features include: all-welded steel construction; electrically-operated, solenoid-controlled, gas distribution system. *Air Reduction Sales Co.*

Circle No. 1.

Regulator

THREAD sealing compound now used in "K-G" regulators is termed "T-Film," a teflon-base compound that is chemically inert and will not affect the gases used. In addition to completely eliminating leakage, the new compound will permit easy removal of nipples from the regulator body for repair. *The K-G Equipment Co.*

Circle No. 2.

Electrode storage oven

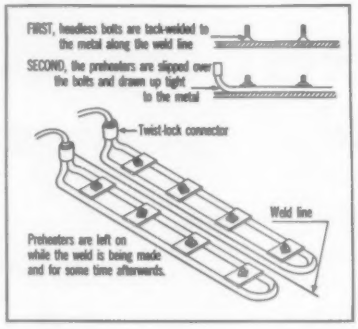
ELECTRODE stabilizer is termed "Aridair." It is for storage of low hydrogen powdered iron electrodes which are susceptible to moisture absorption. Model features twin chemioelectric dehydrators, including electric heat and thermostatic control from 150 to 550 F. *Fred C. Archer, Inc.*

Circle No. 3.

Welding pipe fitting

BRANCH welding pipe fitting is for constructing angular branch connections with a full penetration weld. Termed "Elbolet," it is for making 45-deg connections for directional flow and instrument connections, and for connections into elbows for instruments, drips, and hangar and support connections. *Bonney Forge.*

Circle No. 4.


FIRST, headless bolts are tack-welded to the metal along the weld line
SECOND, the preheaters are slipped over the bolts and drawn up tight to the metal
Twist-lock connector
Weld line
Preheaters are left on while the weld is being made and for some time afterwards.

Preheater

TUBULAR electric heater is for control of preheat and postheat temperature. The "Chromalox" heating unit can raise the temperature of the area around weld to 400-500 F. Can also help in controlling cooling rate after welding. A variety of shapes of heating unit are available. *Edwin L. Wiegand Co.*

Circle No. 5.

Hardfacing

METAL spray unit is for applying hardfacing alloys and other metals in powder form. Designated the "Model C-2 Spraywelder," it can spray hardfacing powders to most types of steel (including stainless) cast iron and copper parts by the "Sprayweld" process. The powdered alloys are first applied by spraying and then are fusion-bonded to the part by heating with an oxyacetylene flame.

Metal spraying using aluminum, zinc, copper, nickel, etc., or high temperature brazing alloys in powder form can also be handled. Unit includes a 3-lb aluminum pistol, chromium-plated hopper, carburetor, combination air regulator-filter, oxygen, acetylene and powder hoses and fittings. *Wall Colmonoy Corp.*

Circle No. 6.

E6010 electrode

MILD steel arc welding electrode, E6010 type, has iron powder coating. Believed to be the first in the E6010 class with iron powder coating, the "Strikeasy 610" is recommended for use in field construction, including pipelines, ship fabrication, and pressure pipe welding, where high quality deposits are required.

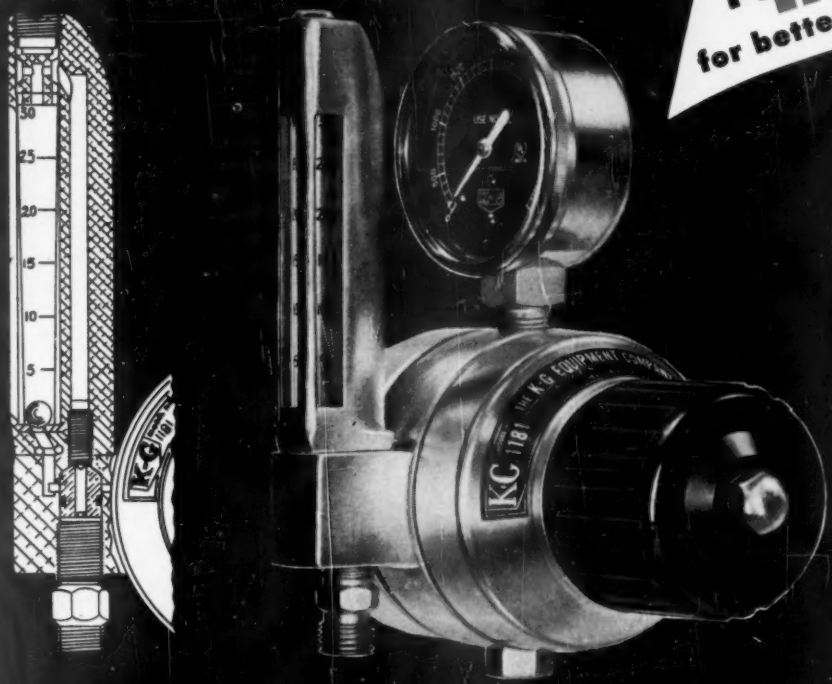
Addition of iron powder to the coating has improved weld quality, states the manufacturer, because of reduction in size of wagon tracks usually formed in mild steel welding.

Other applications of new electrode are fabrication of tanks, fired and unfired pressure vessels, steel casting repairs, and welding of machinery parts. *General Electric Co.*

Circle No. 7.

SO RUGGED...

Another NEW K-G PRODUCT for better welding



...YET SO SIMPLE

Flow* Controls by K-G

Accurate - Dependable

Here is an entirely new, remarkably simple, completely functional flowmeter. Flow* Controls by K-G provide maximum accuracy, visibility and safety in controlling the flow of Argon, Helium and CO_2, for your shielded arc welding.

The Pyrex Glass "heart" is safely mounted in a tough aluminum alloy housing making it virtually unbreakable. Sharp black graduations and numerals make for easy, accurate reading and quick flow rate adjustments.

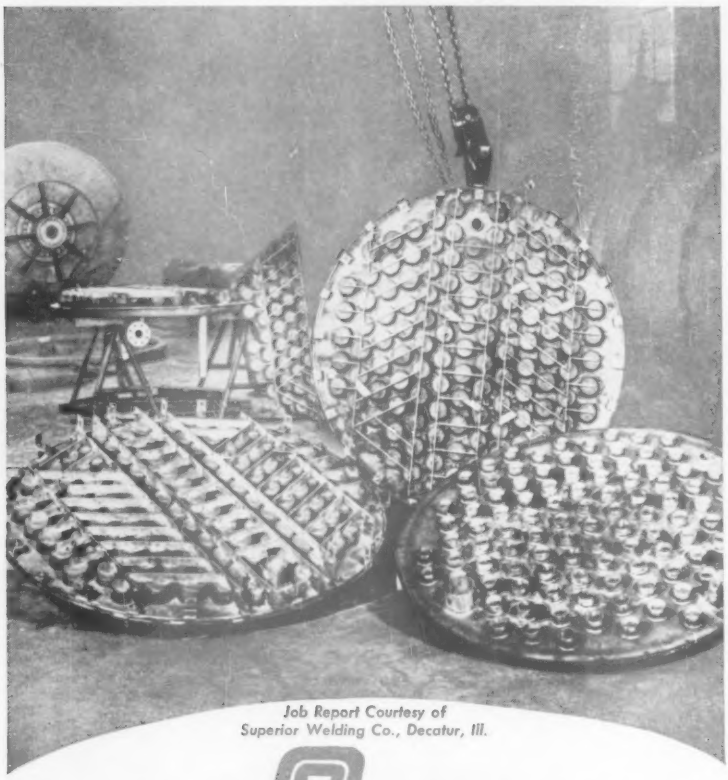
For further information and prices, write to

THE K-G EQUIPMENT COMPANY (Inc.)

A Unit of Air Products, Inc.

Dept. A, Box 538, Allentown, Pa.

When the *quality* of welded equipment is essential to performance

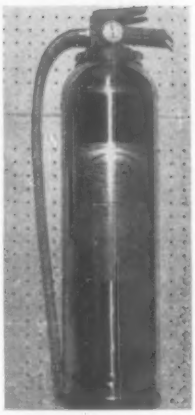


Job Report Courtesy of Superior Welding Co., Decatur, Ill.

WELD WITH ARCOS

STAINLESS ELECTRODES

Welded bubble cap trays, such as these, are used to refine petroleum, petro-chemicals, and food products. They—and the welds—are subjected to corrosion from the liquids and gases passing over them. High processing temperatures intensify the corrosive conditions. ARCOS Chromend KMo Electrodes (Type 316 with 2.5% molybdenum) were used because of their ability to resist acid conditions combined with heat. These electrodes—like all Arcos stainless filler metals—produce welds that are trouble-free both during welding and in service.
ARCOS CORPORATION, 1500 S. 50th St., Philadelphia 43, Pa.



PRESSURIZED fire extinguisher is easy to use, always ready.

Fire extinguisher

PRESSURIZED stainless-steel fire extinguisher can use either water or anti-freeze. New easy-to-read sight gage shows exact air pressure, simplifies routine inspection, insures accurate refill pressure. Squeeze of lever grip located on top releases pressurized water stream.

Two models of the "Fire Guard" are available: "WS-600" with 2½ gal capacity with plain water, 24⅝ in. high, operating pressure of 150 lb; "WS-700," 2½ gal capacity with plain water, 27¼ in. high, operating pressure of 100 lb. Both use "Keloy Quick-Aid" anti-freeze for outdoor use and freezing temperatures. *The General Detroit Corp.*

Circle No. 8.

Electrode

MANGANESE electrode uses 3½% nickel, 13% manganese base wire. Available either coated or bare. Can be used for build-up of hammer mills, crushers, etc.

The "Bergstrom 312" electrode has powdered metal coating, which carries large part of welding current, allowing increase in amperage for rapid deposition of metal without heating. *Industrial Overlay Metals.*

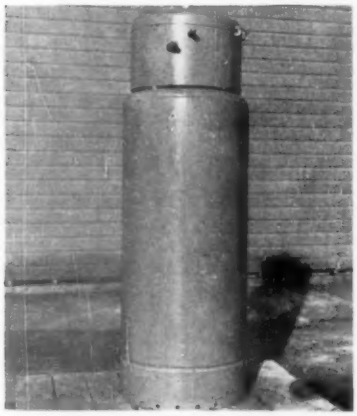
Circle No. 9.

Ignitron salvage

SALVAGE program for welding ignitrons has been initiated. Each used ignitron tube of the following sizes: 5551, 5551A, 5552, 5552A, 5553, 5553B, will have salvage value, when accompanied by request for new tube of like size and for equal quantities. With exception of rebuilt tubes, credit will be accorded.

Following conditions would render used ignitrons unacceptable: dented cylinders, bent or broken water connections, hole burned through the cylinder; damaged anode headers or cables. *Westinghouse Electric Corp.*

Circle No. 10.



Oxygen cylinder

LIQUID oxygen cylinder can hold liquid equivalent to 3,000 cu ft of gaseous oxygen. The "Loxette 3000" model "3-225" customer station cylinder has inner vessel code stamped for 225 psig, with full vacuum and powder insulation. Delivery pressure is variable from 50-200 psig. Basic delivery rate is 150 scfh at 20 F below ambient temperature. Cylinder has removable vaporizer which can be interchanged with vaporizers of different capacity.

Cylinder has liquid level gage which is direct reading. It is rugged, safe, useful where shop piping is available. Weighs when empty 300 lb. Easily handled on standard type hand trucks, states the manufacturer. *Cambridge Corp.*

Circle No. 11.

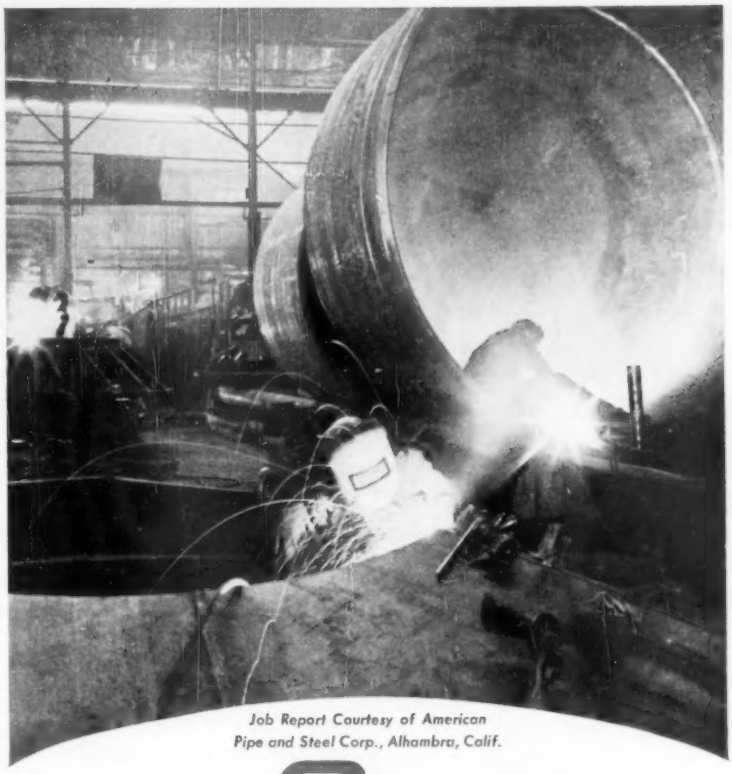
Alloy additives

MAGNETIC alloy additives are said to produce high-hardness deposits of high alloy content. Concentrated additives are designed for semiautomatic or automatic operation, applied with d-c welder wire feeder and magnetic hopper combinations.

With rate of deposit of 20-40 lb per hour, magnetic alloy can be applied to wide range of base metals. Types of "Magnaloy" available: "HF 50" with high alloy content for maximum abrasion resistance, hardness from Rockwell 48-53; "HF 40" produces machinable overlay with high impact resistance, Rockwell hardness 38-43; "WH" is high manganese alloy, has deposit with full Hadfield properties, work hardens from Rockwell 20 as deposited to Rockwell 45, "HH" is for applications requiring strength at high temperatures combined with oxidation resistance; "BU" is for sizing for hardfacing, provides dense ductile base with Rockwell hardness from 29-33. *Superweld Corp.*

Circle No. 12.

When heavy chrome-moly welds must pass X-Ray Inspection



Job Report Courtesy of American Pipe and Steel Corp., Alhambra, Calif.

WELD WITH ARCOS

CHROME-MOLY ELECTRODES

In setting up this job—fabricating heavy alloy components of lead melting pots—new welding procedures were required to assure that all welds would pass x-ray inspection. With the help of Arcos Technical Service, both manual and submerged arc procedures were established and ARCOS Electrodes and Rods were used exclusively. The quality of Arcos weld metal consistently assures internally sound, flaw-free welds. And Arcos Technical Assistance prevented problems on what could have been a "tricky" job. ARCOS CORPORATION, 1500 S. 50th St., Philadelphia 43, Pa.

important announcement to *United* brazing customers

If you are presently using United Phoson 15 alloy (government grade III) this is notification that a switch to Phoson 6, the most talked about brazing alloy in the country, will cut your costs at least 30 per cent with *equal performance* in every respect.

Extensive field tests—eight years of them—have proven Phoson 6 best for brazing copper and brass. Most of United's customers, 80 per cent, in fact, have already changed.

here's the story!

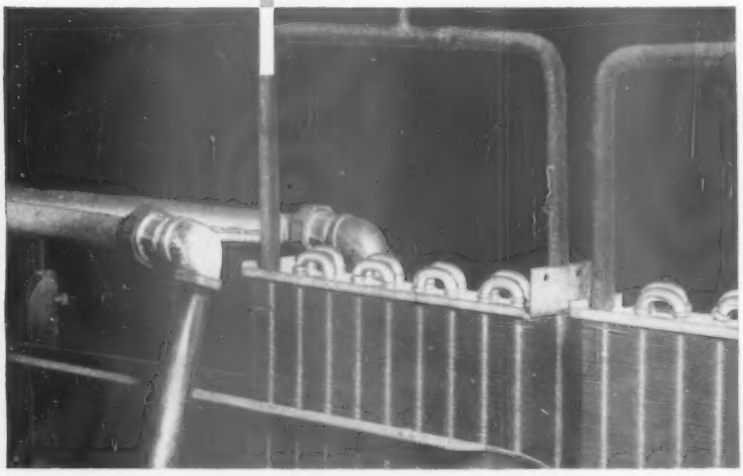
Silver 6%	Brazing Temperature 1300°
Copper 87¾%	Original Tensile 92,000 PSI
Phosphorous 6¼%	Rockwell 15T 86
AWS BCuP 3	

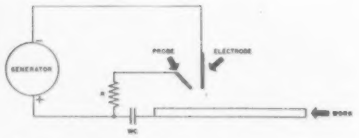
Write for the facts today.

Permanently United

UNITED WIRE AND SUPPLY CORPORATION

PROVIDENCE 7, RHODE ISLAND





Spot welding

DIFFICULTIES of high-frequency arc starting in Tig (tungsten inert-gas) spot welding have been lessened, particularly in multiple spot-welding operations, by the addition of pilot-arc starting.

Heat for the localized fusion weld, in this process, is produced by an electric arc between a tungsten electrode and the workpiece. When the welding arc is needed, it is automatically started by the pilot arc. Welding action is controlled by the current input to the arc, and the time the arc is sustained on the workpiece. *Linde Air Products Co.*

Circle No. 13.

Headrest goggle

COOL, light and comfortable, single-cup headrest "Sologoggle" is for welding, brazing, cutting, grinding. The combination fits over latest type spectacle goggles or any personal corrective goggles. Can be fitted close to forehead, cheeks, without pressure to exclude heat and light, or just off the face for ventilation.

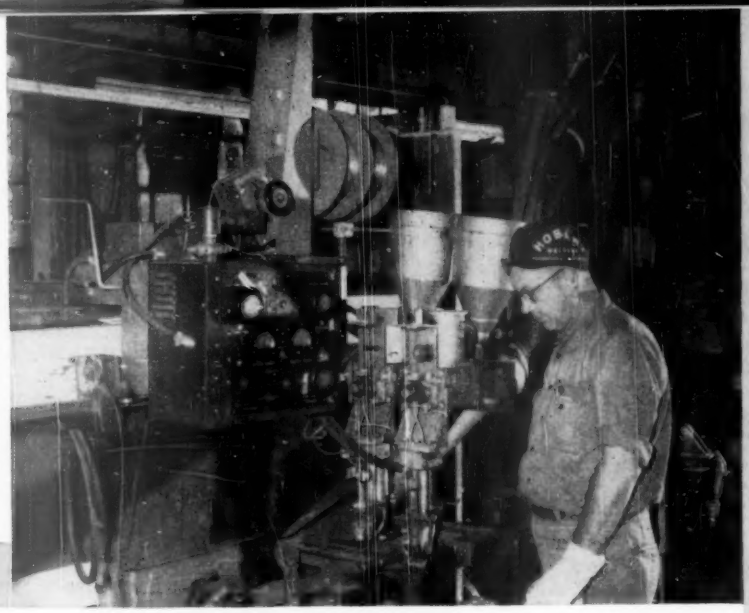
The "Sologoggle" is held against the face by adjustable elastic headband. Molded of flame resistant plastic, it accommodates 2 by 4¼ in. filter lense, in shades 3 to 8, and cover glass, both held flexible by single spring. Combination has ratchet-type headsize adjustment. By turning knob to right or left proper headsize is obtained. *The Fibre-Metal Products Co.*

Circle No. 14.

Tig torch

NEW safety feature, a rubber skirt, has been developed for the "Visuweld" water-cooled torch for Tig (tungsten inert-gas) welding. The skirt, an integral part of the torch head, provides a sheath over the lip of the nozzle, preventing high frequency arcing out. *Tec Torch Co., Inc.*

Circle No. 15.



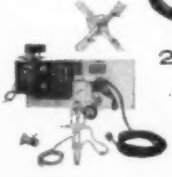
See for yourself how HOBART *automatic welding cuts costs*

You can now have the advantages of automatic or semi-automatic welding on your own work without the need for complicated installations. Hobart's new and greatly simplified controls, let you do automatic welding with more speed, higher quality, and at much lower production costs. No need for highly skilled operators. Merely set the controls for uniform weld deposit and speed. Arc length automatically adjusts itself along the line of travel. Get full particulars, no obligation. Fill out and mail the coupon today.

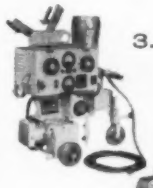
HOBART Brothers Company,
Box U-1262, Troy, Ohio, Phone FE 21223
"One of the world's largest builders of arc welders"

Automatic heads

1. Simplified Automatic Controls for submerged arc welding.

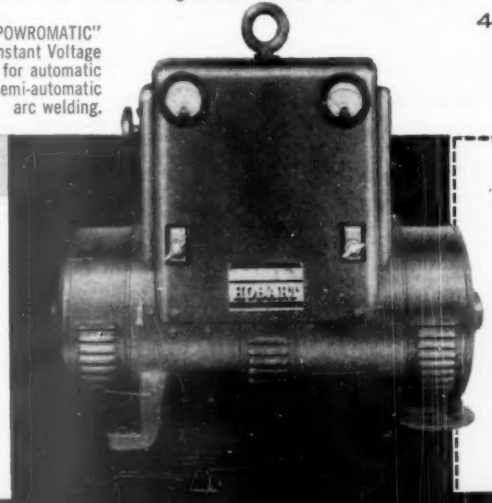


2. Simplified Automatic Controls for inert gas arc welding.



3. Tractor Type for automatic submerged arc welding.

4. "Migarc" for inert gas arc welding



"POWROMATIC" Constant Voltage for automatic and semi-automatic arc welding.

It's NEW—it's FASTER
and easier to weld in all positions.

HOBART ROCKET 14

Here's Hobart's new development in iron powder electrodes, designed for all position welding. The arc is soft and stable without the tendency to stick on either AC or DC. Slag is practically self removing. Contour of weld is easily controlled by arc length. You'll be amazed at the performance once you've tried this new electrode.

Try "Rocket 14" for Extra Advantages in Welding.

- **All position welding.**
- **Higher deposition rates.**
- **The use of higher amperages.**
- **More inches of weld per electrode.**
- **Easy to use; requires no special technique.**
- **Excellent for AC or DC.**

Check the coupon for complete details.

HOBART BROTHERS COMPANY, BOX U-1262, TROY, OHIO

Without obligation, send me complete details on:

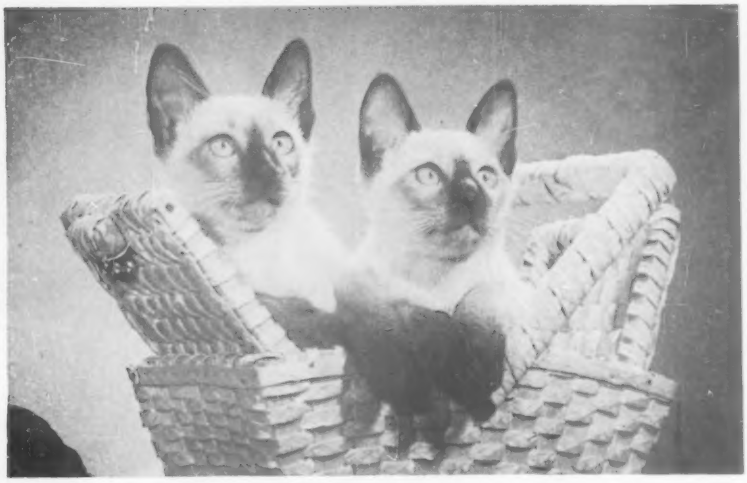
- ☐ Automatic Submerged Arc Welding.
- ☐ Automatic Inert Gas Arc Welding.
- ☐ Semi-automatic Submerged Arc Welding.
- ☐ Semi-automatic Inert Gas Arc Welding.
- ☐ Tractor Type Submerged Arc Welding.
- ☐ Send more information on "Rocket 14" Electrodes

Name_____ Position_____

Firm_____

Address_____

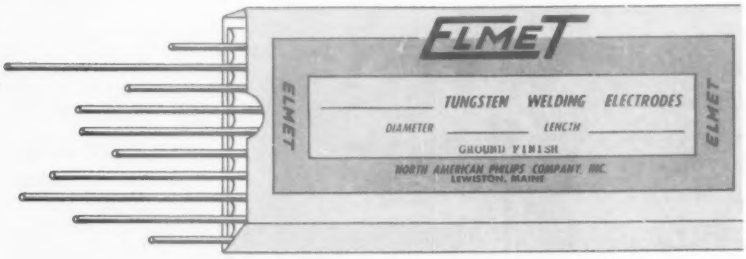
☐ Send complete catalog on all types of manual arc welders, both gas and electric drive.



ALIKE AS TWO ELMET ELECTRODES

Nature does it without even trying, but on the production line it takes a lot of human skill to attain absolute uniformity. In the making of Elmet tungsten electrodes, however, the result is well worth the extra effort. For Elmet electrodes are completely uniform, not only in surface finish and dimensions, but more important, in their composition, characteristics and physical structure. This means that, with Elmet, you get consistently superior performance from electrode to electrode with a minimum in readjustment of equipment and voltage.

Elmet pure tungsten and thoriated tungsten electrodes are furnished in cleaned finish and in the mirror-smooth centerless ground finish. They are available in packages of 10 in all standard diameters from .040" to ¼" and from 3" to 18" in length.



Why not place a trial order with your distributor today, or use the coupon below to obtain full information and an informative folder on tungsten electrode welding.

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We are a Distributor ☐ User ☐
Please send me your Distributor proposal ☐

NEWS . . . . . *from page 6*

welding supervisor, Newport News Shipbuilding & Drydock Co., and "Welding of equipment for nuclear plants," Norman Block, consulting metallurgist, Foster Wheeler Corp.

A feature of the Jan. 30 session will be an address on welding stainless steel by George Linnert, research welding metallurgist, Armco Steel Corp., and 1956 Adams Lecturer of the American Welding Society.

Also scheduled for this session are papers by R. C. Singleton, vice-president of engineering, Nelson Stud Welding on "Research & Applications of stud welding," and J. E. Dato, assistant manager, welding, Linde Air Products Co., on "Role of inert gas welding in industry."

Speakers for the Jan. 31 technical sessions are:

Morning—Jack D. Robinson, assistant factory manager, Bendix Aviation Corp., "Applications of welding for salvage of machine parts"; E. E. Williams, special engineer, Factory Insurance Association, "Fire Safety for welding & cutting operations"; and Arnold P. Lage, supervisor, welding group, Menasco Mfg. Co., "Pressure welding."

Afternoon—J. R. Stitt, research and welding engineer, R. C. Mahon Co., "Distortion in welding—causes, prevention, and cure;" Wallace C. Rudd, vice president, New Rochelle Tool Corp., "High frequency resistance welding;" and O. H. Kuhlke, welding engineer, General American Transportation Corp., "Fabrication by welding of aluminum structures."

American Blower has diamond jubilee

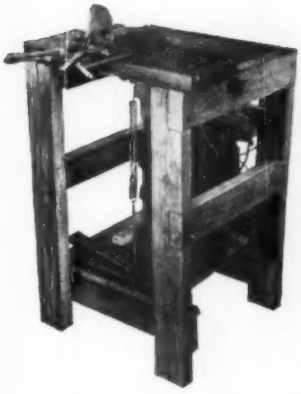
American Blower Corp., with main offices and largest plant in Dearborn, Mich., celebrates its 75th year of business operation this year.

A division of American Radiator & Standard Sanitary Corp., a merger which occurred in 1927, American Blower Corp. boasts three plants—one in Dearborn, one in Columbus, Ohio, and a western plant at San Leandro, Calif.

Founded in November, 1881, by W. D. Smith, American Blower Corp. has grown to its present diversified operation. The firm manufactures dust collectors, industrial fans, forced draft fans, unit heaters, attic and kitchen fans, air conditioning equipment, refrigeration machinery.

American Blower, first established in Detroit, removed to Dearborn in 1935 to erect the first unit of its present facility. President of the firm is J. C. (Cy) Linsenmeyer.

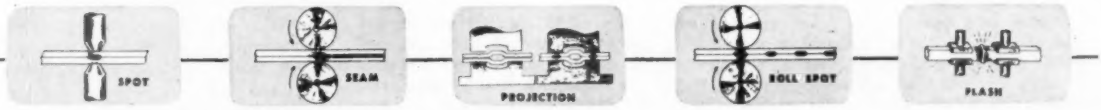
From the

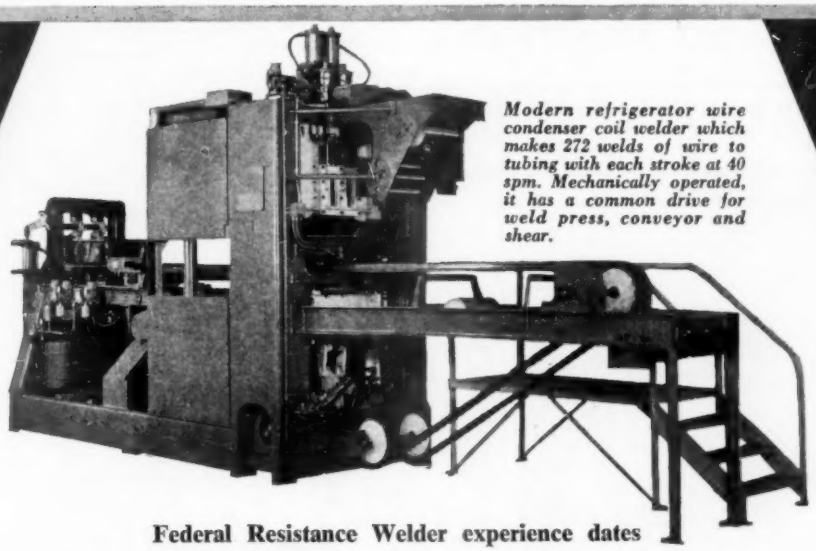


beginning . . .

First experimental multi-spot welder model developed in 1901 for welding fan blades to hubs.

FEDERAL
has always been
FIRST IN RESISTANCE WELDING





Modern refrigerator wire condenser coil welder which makes 272 welds of wire to tubing with each stroke at 40 spm. Mechanically operated, it has a common drive for weld press, conveyor and shear.

Federal Resistance Welder experience dates back to the very beginning of resistance welding. From that day to this, Federal has remained "First in Resistance Welding" engineering, design and development.

5

Federal WELDERS · Warco PRESSES

THE FEDERAL MACHINE AND WELDER COMPANY
WARREN, OHIO

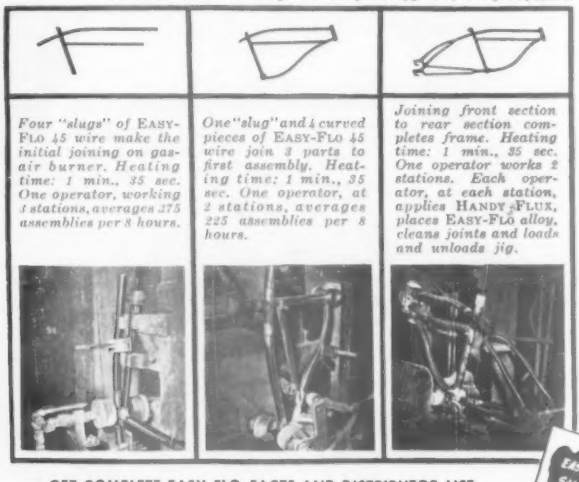
Here's Why Columbia Bicycle Frames Are

EASY-FLO BRAZED

The *speed* and *economy of labor* enjoyed with EASY-FLO silver brazing of tubular assemblies of all kinds are outstanding. The old method used by Columbia required 42 men to grind fillets and clean the brazed joints on 1000 frames a day. Now, with EASY-FLO and HANDY FLUX, 3 men do the finishing on the same number of frames. Five pieces of curved wire and five small slugs of EASY-FLO 45 are used to produce a frame that is as strong and indestructible as though it were one piece.

Here is the "joining sequence" of one of the many models of Columbia frames.

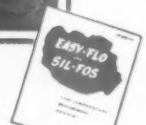
Photos and data courtesy The Westfield Mfg. Co., Westfield, Mass.



Four "slugs" of EASY-FLO *45 wire make the initial joining on gas-air burner. Heating time: 1 min., 35 sec. One operator, working 4 stations, averages 375 assemblies per 8 hours.*

One "slug" and 4 curved pieces of EASY-FLO *45 wire join 3 parts to first assembly. Heating time: 1 min., 35 sec. One operator, at 2 stations, averages 225 assemblies per 8 hours.*

Joining front section to rear section completes frame. Heating time: 1 min., 35 sec. One operator works 2 stations. Each operator, at each station, applies HANDY FLUX, *places* EASY-FLO *alloy, cleans joints and loads and unloads jig.*



GET COMPLETE EASY-FLO FACTS AND DISTRIBUTOR LIST.

BULLETIN 20 explains why high strength, speed and economy are inherent in EASY-FLO brazing. Also gives Handy information about joint design and fast brazing methods. Get your copy, with distributor list, by writing today.

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MONTREAL, CANADA

Issue specification on hardfacing rods

The first specification (AWS A5.13; ASTM A399) covering welding rods and electrodes for hardfacing has been issued by the American Welding Society and the American Society for Testing Materials.

Forty-five classifications of filler metal are established by this specification, including many of the commonly used hardfacing materials. This involves high speed steels, austenitic manganese steels, austenitic high-chromium irons, cobalt-base filler metals, copper-base and nickel-chromium-boron filler metals. Copies of the specification can be obtained, price of 40 cents, from American Welding Society, 33 W. 39th St., New York City 18.

206 attend NWSA West Central meeting

Attendance at the West Central Zone meeting of National Welding Supply Association reached 206 distributors and manufacturers. The meeting was held Oct. 29 and 30 at the Hotel Nicollet, Minneapolis.

Following introductory remarks at the opening session by vice-president Mars, president Stilwell discussed attributes for a successful leader. A panel discussed solutions to basic financial problems. The afternoon session of Oct. 29 dealt with various welding problems. A panel discussion on Oct. 30 probed methods of selling to the construction industry.

Discuss plans for IAA convention in April

Members of the standing program, publicity and arrangements committee met recently in Minneapolis, with members in the Twin-City area, to discuss the convention of the International Acetylene Association, April 1-3, 1957. The purpose of the conference was to lay out the broad concept of the program, to outline possible sessions and papers in fairly good detail with full consideration given to local and regional interests. In all, sixteen IAA members and nine industrial executives, not members of IAA, joined the group for luncheon.

Tweco publishes news letter

Issued now and then, according to the masthead, Tweco Products, Inc., Wichita, Kansas., has begun publication of a newsletter entitled "The Tweco World." News of new products and welding applications is included in the one-page newspaper size publication.

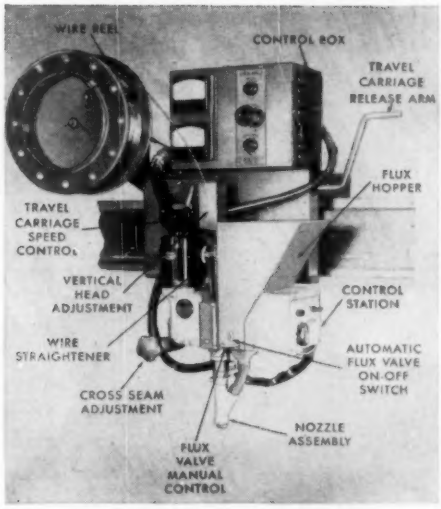
When a line of automatic welders for DC and AC operation

Has the most sensitive controls for fast starting and uniform welds

Yet is easiest to adapt to any fixture

WHY

buy anything but LINCOLNWELD for automatic welding



New automatic

LINCOLNWELD

simplifies tooling

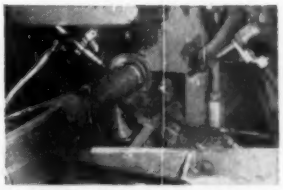
...increases production dependability

LAF-3 Lincolnweld for DC welding
LAF-4 Lincolnweld for AC welding

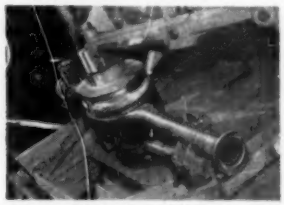
Universal, foolproof controls give you . . .

- **dependable starting . . . uniform quality welds**
- **cold starts or hot starts**
- **controllable inching speed**
- **simple accurate positioning**
- **integral or remote controls**

WRITE FOR Bulletin SB-1355 for complete specifications.



Longitudinal Welds *made at low cost on automobile rear end housings with LAF-3 Lincolnweld and simple fixture.*



Circular Welds *in welding cover to back face of banjo.*

THE LINCOLN ELECTRIC COMPANY

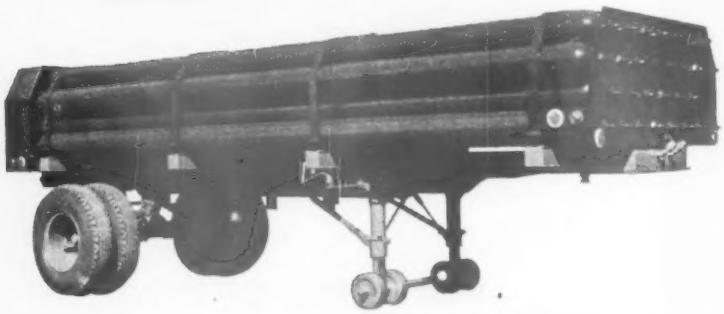
Dept. 1723, Cleveland 17, Ohio

LINCOLN . . . *one dependable source for all your arc welding needs— welders • power sources • fluxes • electrodes • application engineering.*

REDUCE CYLINDER HANDLING up to 50%

with INDEPENDENT *Gas Supply TRAILERS*

TRANSPORTING — Argon — Carbon Dioxide — Helium—Nitrogen— Oxygen — Boron Trifluroide — Hydrogen — Ethylene. Trailer capacities from 187,000 cu. in. to 750,000 cu. in. water capacity. Trailer tubes ICC3A-2400 Specifications with 2400 PSIG Working Pressure.



Sizes and weights to meet all State requirements.

Can be mounted on bases for permanent storage.

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Welding committee hears defense role

At a recent meeting of the welding equipment advisory committee and officials of the Business & Defense Services Administration and the Department of Defense a recommendation was made to establish task groups to provide up-to-date information for development of national defense mobilization.

The task groups would represent various segments of the welding equipment manufacturing industry. The proposal was made after committee members heard a review of the defense mobilization situation as it affects their industry and a discussion of proposed directory of codes for welding equipment needed by the Department of Defense.

Task groups will be appointed as soon as recommendations on membership are secured. One of the groups will prepare information for BDSA on industry capacity to produce under emergency conditions and on materials requirement. The other will work with the Department of Defense and BDSA in developing an adequate code directory for welding equipment.

BDSA officials representing the iron and steel, aluminum and magnesium, copper, and miscellaneous metals and minerals division, told the advisory group that except for a few materials and forms the outlook for materials in the coming months is favorable. Committee members said that the welding equipment industry is not now handicapped by any shortages of materials.

A BDSA spokesman detailed the system for those empowered to give defense rated orders. The welding equipment industry was urged to make the required use of appropriate symbols in placing defense rated orders for any of the controlled materials—steel, copper, aluminum, and nickel alloys.

J. Robert Jones, director of the BDSA metalworking equipment division, presided. The following industry representatives were present: R. H. Imes, P. R. Mallory & Co., Inc.; John H. Blankenbuehler, Hobart Bros. Co., R. H. Taylor, Electroloy Co., Inc.; E. B. Lutes, Arcrods Corp.; George Luther, Air Reduction Sales Co.; J. C. Wilson, Jr., Acro Welder Mfg. Co.; Nicholas H. Kiernan, Metal & Thermit Corp.; Niels C. Miller, Miller Electric Mfg. Co., Inc.; Gene P. Hopkins, Nelson Stud Welding Div., Gregory Industries; T. Embury Jones, Precision Welder & Flexopress Corp.; Sam Sciaky, Sciaky Bros., Inc.; E. A. Daniels, Victor Equipment Co.; J. M. Johnston, Weltronic Co.

Introducing

"CABLE-SPLINT"*

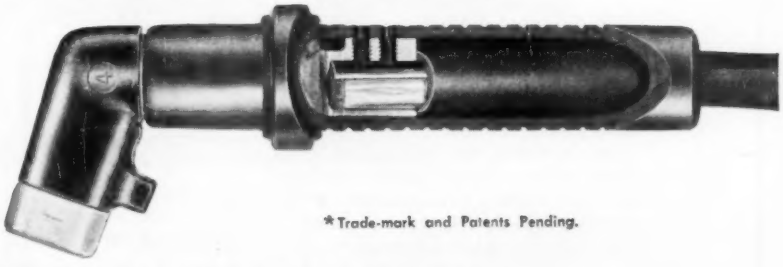
. . . Solves the CABLE-FRAYING Problem!

The fraying of welding cable at the area where the cable connects to electrode holders has existed since the day arc-welding first began, and has wasted more man hours, more welding cable, and has necessitated more maintainance, than any other known factor.

"CABLE-SPLINT" completely, efficiently, and inexpensively solves the fraying problem by supporting the cable where it is stripped of its natural supporting jacket.

Driven down between the core wires and the jacket of the cable by light hammer blows the "CABLE-SPLINT" becomes a third member of the cable.

By this new method it is the natural resilience of the cable jacket which tightly binds the supporting "CABLE-SPLINT" to the core wires and solidly anchors it to the jacket.



*Trade-mark and Patents Pending.

"CABLE-SPLINT" is another exclusive feature of the "SHORTSTUB" Electrode Holder. The reinforced cable end may be either clamped or soldered to the "SHORTSTUB" according to common practice.

Contact your local distributor or write direct for full information.

BERNARD WELDING EQUIPMENT CO.
10232 S. Avenue 'N' · Chicago 17, Illinois

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For Years

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has been FIRST with every important advancement made in

ELECTRODE HOLDERS

—no wonder then, that thousands of actual users have switched to HI-AMP—they quickly discovered, through experience, that you can't beat a HI-AMP Electrode Holder, regardless of model, when it comes right down to practicability, performance and economy in maintenance.

When are you going to switch? Just ask any Welding Supply Dealer ANYWHERE for PROOF of the above statement.

LENCO, INC.

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Weld with HI-AMP

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WELDER BRUSHES

for all types and makes of welding equipment

Everything you need from *one* source, with *one* responsibility. The fast, economical way to order. Catalog gives complete specifications, factory numbers, scaled drawings, etc. Write for your free copy today.

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To hold titanium course in March

A comprehensive five-day short course on titanium will be held immediately following the Western Metal Congress, March, 1957, in Los Angeles.

The course is patterned after a similar one on titanium edited for the new Metals Engineering Institute by Dr. Walter L. Finlay of Rem-Cru Titanium, Inc.

Classes will be limited to 100 persons, according to Dr. Anton de S. Brasunas, director of the American Society for Metals, Metals Engineering Institute. Suggestions as to course content will be welcomed from prospective students.

NWSA western zone meeting sets record

Attendance at the annual western zone meeting of the National Welding Supply Association reached 180, a record high according to vice-president Willis Stanfill. The meeting, held Nov. 1 and 2 at the Hotel St. Francis, San Francisco, was marked by three business sessions featuring interesting talks.

Included in the program were addresses on the scope of sales management, advantages of different types of business organization, help manufacturers can give to distributors and "The welding distributor—1957 model."

Revise acetylene compressed gas data

The Compressed Gas Association, New York City, has issued revised editions of two pamphlets covering acetylene and compressed gases. This marks the third edition for each of the booklets. Pamphlet G-1 is entitled "Acetylene;" Pamphlet P-1 is entitled "Safe Handling of Compressed Gases." Copies are available from the association.

Form consulting metal firm

Daniel S. Karp and John Lesser have formed Karp, Lesser & Co., Inc., in New York City. The firm will function as engineering management consultants to the precision sheet metal fabrication field and allied fields. Offices are located at 60 E. 42nd St. Mr. Karp was formerly president of Karp Metal Products Co., Brooklyn. Mr. Lesser was also associated with Karp Metal Products. He is a member of the American Welding Society.

NEW "Unionmelt" Welding Assemblies

for greater job versatility- performance dependability

Versatility and dependability are yours at an all time high in an improved new line of UNIONMELT welding assemblies . . . These units embody the greatest variety of machine combinations, job applications, and design features ever offered for submerged arc welding.

Wire feed units are simply constructed and are highly efficient . . . Identical mounting dimensions for heads, brackets, and slides allow for any number of desired assembly combinations.

Welding heads have exceptional flexibility because of sturdy new mounting fixtures which provide for vertical, horizontal, and rotary adjustment. Stationary and self-propelled combinations are also available.

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COMING EVENTS

DEC. 3-4: Southeastern Zone Meeting, National Welding Supply Association, Dinkler-Tutwiler Hotel, Birmingham, Ala.

DEC. 6-7: Southwestern Zone Meeting, National Welding Supply Association, Statler-Hilton Hotel, Dallas.

Jan. 28-31, 1957: Eighth National Plant Maintenance & Engineering Show, Cleveland Public Auditorium, Cleveland.

JAN. 30-31: Midwest Welding Conference, Armour Research Foundation of Illinois Institute of Technology, Chicago.

MARCH 25-29: Tenth Western Metal Congress & Exposition, American Society for Metals, Los Angeles. Congress at Ambassador Hotel; exposition in Pan-Pacific Auditorium.

APRIL 1-3: Fifty-seventh Annual Convention, International Acetylene Association, Hotel Nicollet, Minneapolis.

APRIL 8-12: Fifth Spring and Thirty-eighth Annual Meeting, American Welding Society, Hotel Sheraton, Philadelphia.

APRIL 9-11: Fifth Annual Welding Show, American Welding Society, Convention Hall, Philadelphia.

MAY 13-16: Thirteenth Annual Convention, National Welding Supply Association, Hotel Mayflower, Washington, D. C.

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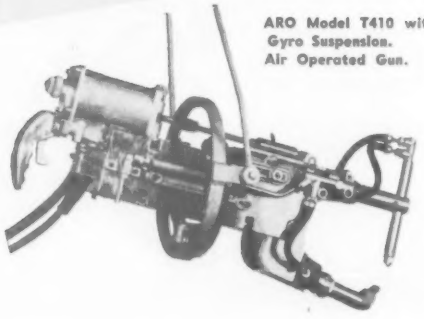

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Lincoln gives arc welding awards

First award of $5,000 in the recent competition for ideas to accelerate the progress of arc welding, sponsored by The James F. Lincoln Arc Welding Foundation Cleveland, was given to Herman Tachau of Santa Fe, New Mex., an engineer with the New Mexico State Highway Department. The award was one of 20, totaling $20,000.

The award was presented to Mr. Tachau for an outline of a plan to enable more engineers to design machines and structures for arc welding.

The second award of $4,000 was presented to Van Rensselaer P. Saxe, a consulting engineer of Baltimore, Md. T. C. Kavanagh, a consulting engineer of New York City, received third award of $3,000. Bruce G. Johnston, a professor of structural engineering at the University of Michigan, received fourth award of $2,000; Orville T. Barnett and John Rudy, Armour Research Foundation, Chicago, shared the $1,000 fifth award.

Dr. E. E. Dreese, chairman of the Lincoln Foundation, in announcing the awards, stated that the general theme of the majority of ideas submitted emphasized the need for greater education of the public to the inherent advantages and economy of welded design in machines and structures of all types.

Dr. Dreese also stated that many of the ideas received suggested that to bring about a greater public appreciation of welding, engineering schools needed to give better coverage to the subject of welded design in the structural and mechanical fields.

Distributor celebrates 25th anniversary

Founded in 1931, Welding & Cutting Supply Co., Cleveland, marked 25 years of business operation on Nov. 8. Welding & Cutting Supply Co. is located at 2401 Carnegie Ave.

Welding used in English tug

Welding was used extensively in constructing a new diesel tug, the *Jamoosa*, at the Hessle Shipyard of Richard Dunston Ltd. of England. The tug was built for Qatar Petroleum Co., Ltd., London.

Distributor appointments

Weldrod Department, Ampco Metal, Inc., Milwaukee: Gaspro, Ltd., Honolulu; Georgia Supply Co., Jacksonville, Fla.

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a Pipe Beveler with a Cutting Range of

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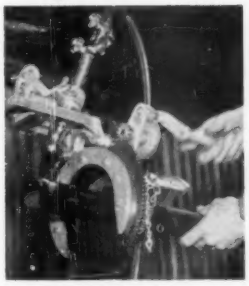

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★ EASY TO OPERATE
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11%-13½% MANGANESE-NICKEL STEEL
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HOT ROLLED
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1. 14 to 18 foot bars mean less scrap from cutting.
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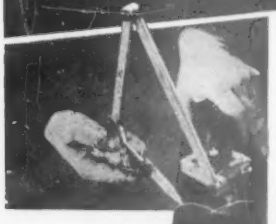
LAY OUT PIPE JOINTS
in minutes!



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THE CONTOUR MARKER

Sid T. Jordan has been named southwest district manager for Rankin Mfg. Co., Alhambra, Calif. His territory will include most of California, New Mexico, Arizona, Colorado, southern portion of Utah and El Paso, Tex. Mr. Jordan has been in sales and service for Kenweld for more than two years. He succeeds *Ted Braucht*, who resigned recently to form his own welding supply shop at Torrance, Calif.

Roy Williams has been appointed district manager in Minneapolis by The Lincoln Electric Co., Cleveland. He succeeds *Marshall Ford*, who has opened a new district office for the company in Eveleth, Minn.

A. S. Blodget, Jr., district manager in Pittsburgh for Air Reduction Sales Co., has been appointed regional sales manager with offices in New York City. *Sam S. Bruce, Jr.*, succeeds Mr. Blodget as district manager. He has been Chicago district manager. *G. J. Dekker*, district manager in Milwaukee, succeeds Mr. Bruce as Chicago district manager. (The Chicago district has been expanded to include the Milwaukee area.) *C. F. Woelm*, assistant sales manager in Milwaukee, has been appointed branch manager at that location.

Blodget

J. E. Montgomery, Jr., has been appointed production manager for C. B. Herrick Mfg. Corp., Cleveland. Mr. Montgomery formerly was production manager and treasurer of The Dunham Co., Berea, Ohio. He is a member of the American Society of Lubrication Engineers.

Otto E. Fenske, Jr., was recently appointed assistant sales manager for Mid-States Welder Mfg. Co., Chicago. He has been sales representative for Mid-States in the Chicago area and Wisconsin for the past several years.

Karl M. Weigert, research metallurgist, has joined the research division of the Curtiss-Wright Corp., Quehanna, Pa. He was formerly associated with Goldsmith Bros. Smelting & Refining Co., Chicago. He will be in charge of brazing research on new methods and materials. For the last ten years Mr. Weigert has studied metallurgical aspects of brazing alloys and has published several papers in the field. He is a member of the American Welding Society and the American Society for Metals. He is also active on the committee on brazing and soldering of AWS.

Progressive Welder Sales Co., Detroit, has made the following appointments: *George W. Enk* has been named general sales manager for the American and Canadian operations of Progressive. *L. F. Van Nortwick* has been named general sales manager, Frostrode Division of the Warren Alloy Division. *Bernie Walker* has been named assistant director of manufacturing of all divisions. *Earl R. Stiefel* has been appointed director of purchases.

Enk

Frank N. Rush has been elected a director of Superweld Corp., North Hollywood, Calif.

Died . . .

C. E. (Chuck) Phillips, president, C. E. Phillips Co., Detroit, died Sun., Oct. 28. He had been closely associated with the welding industry for more than 35 years. Beginning his career as a weldor he soon became a job shop owner. Specializing in repair of heavy castings, the C. E. Phillips Co. became known as an expert in cast iron welding. Mr. Phillips pioneered the development of the nickel-type electrode for use in making machinable welds on cast iron. He later expanded his activities into the welding supply field, specializing in the distribution of hardfacing alloys and cast iron electrodes.

E. D. Schively, manager of Calgary (Albert, Canada) branch office of Worthington (Canada) 1955 Ltd., died recently after a brief illness.

Rolland Holbrook of Imperial Oxygen Ltd. died recently.

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Eliminated 5 Separate Soldering Operations

Nickel Silver replaced Silver Solder Gave better job — Lowered costs

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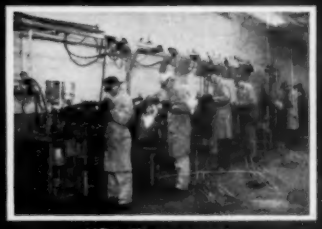

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FREE! Your copy is waiting for you. This is The Manual to read from cover to cover for background . . . the one to keep in your pocket to have on the job. It gives you, at your finger tip, complete use data.

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When You Weld Cast Iron Select the Correct

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FUSE-WELL No. 11, *Square*—Gray Cast Iron Welding Rod for Acetylene use in filling or building up new or worn castings producing machineable welds.

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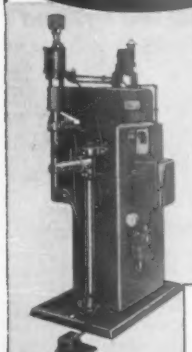

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30 YEARS AGO

(Taken from *The Welding Engineer* of December, 1926)

W. M. Bastable has been appointed manager of the New York office of Electric Welder Controller Co., Pittsburgh. He has been sales manager for Wilson Welder & Metals Co., Hoboken, N. J.

—30 YEARS AGO—

M. W. Pierce has joined Welding Equipment Co., Chicago, as a partner. He was formerly with Cutler-Hammer Mfg. Co., Milwaukee. J. F. Romadka is also a partner.

—30 YEARS AGO—

T. A. Oberhellmann, formerly representing The Lincoln Electric Co. in St. Louis, has organized the Progressive Welder Sales Co. Offices and warehouse are located at 1025 N. 6th St., St. Louis, Mo.

—30 YEARS AGO—

Wickwire Spencer Steel Co. has appointed Buckeye Welding Supply Co., Cleveland, as distributor of welding wire.

—30 YEARS AGO—

The Victorian Institute of Welding Engineers, with headquarters in Melbourne, Australia, will begin publication soon of a welding journal. The journal will be called The Australian Welding Engineer. Its aim is to stimulate interest in welding.

—30 YEARS AGO—

Union Carbide & Carbon Corp., New York City, recently acquired assets of the United States Vanadium Co., including the ore bodies located on the western slope of the Rocky Mountains, about 300 miles west of Denver.

—30 YEARS AGO—

A. M. Candy, Westinghouse Electric & Mfg. Co., addressed the eastern New York section of the American Society of Mechanical Engineers at Schenectady, N. Y., on the subject of welding structural steel.

—30 YEARS AGO—

A number of cash awards will be given during the year 1927 for the best papers submitted to the American Society of Mechanical Engineers on the subject of arc welding. The Lincoln Electric Co., Cleveland, has offered the prizes. Papers are expected to be submitted from all countries of the world.

No. 20 The **RIGHT FLUX for the JOB** No. 41

No. 45 No. 88

BACKED BY 60 YEARS OF TESTED PERFORMANCE

Whatever the particular job you have to do—we have the right FLUXINE you need. Besides our 25 FLUXINES we carry a complete line of "KOP-R-ARC" coated rods for welding copper and all copper alloys.

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CUTTING MACHINES, AIRCO Camo & Radiagraphs and NATIONAL No. 5.
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SPOT WELDER, National, 40 KVA, Used.
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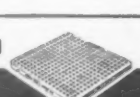
Welding  **Platens**

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Each tip will be Reseated, Redrilled, Refinished and flame tested . . . then returned to you—Ready to give you the same service as a new tip.
Your cost for this service: Only $1.25 ea. Over 100 at $1.00 ea. Terms: 2% 10 days.
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Send us a trial box of tips today—Satisfaction GUARANTEED.

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"PROMPT APPARATUS REPAIR SERVICE"
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GRADUATE ENGINEER

Excellent opportunity for a recent or experienced graduate engineer or equivalent who has a desire to become familiar with or has experience in welding. The applicant selected will assist in research, development and production of welding processes and act as consultant to other sections. Experience in aircraft manufacturing preferred. Salary commensurate with experience and ability to work with high degree of independence.

At Republic you will enjoy an exceptional employee benefit program which includes company-paid hospitalization insurance, surgical insurance, accident, life insurance, 2-fold pension plan, tuition (2/3), individual merit rated increases PLUS Long Island living—the most diversified way of life in America . . . in sports and recreation, in culture, in social pursuit.

Please send resume, including details of your technical background to:

Mr. Charles J. Ketson
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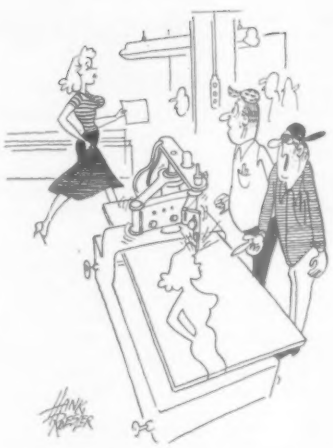

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51. RADIATION—The Budd Co. Illustrated booklet (J-379) describes types of nuclear radiation services: gamma radiography, shielding and exposure equipment, custom radiation detection and control equipment.

52. FIRE EXTINGUISHER—The General Detroit Corp. 4-page illustrated folder describes "Keloy" loaded stream anti-freeze for use in water-type hand fire extinguishers such as pump tanks, cartridge operated liquid extinguishers, etc. It is claimed to end annual recharging.

53. GRINDING WHEELS—Electro Refractories & Abrasives Corp. Illustrated bulletin GD-56 deals with grinding wheel specifications and marking. Uses of aluminum oxide and silicon carbide abrasives in grinding are also discussed.

54. WELDOR'S CLAMP—Havens Structural Steel Co. Illustrated booklet describes C clamps available, giving specifications.

55. ARC WELDER—The Lincoln Electric Co. 20-page booklet illustrates and describes the "Lincolnweld" submerged arc welder, providing a discussion of operation, construction and attachments.

56. X-RAY PROTECTION—St. John X-ray Laboratory. Illustrated sheet details advantages and features of film badge service for monitoring and protecting personnel exposed to radiation hazards.

57. OXYGEN CYLINDER—Linde Air Products Co. 4-page illustrated folder (F-1023) details construction and capacity of "LC-3" liquid oxygen cylinder.

58. ELECTRODES—Hobart Bros. Co. 28-page catalog, EW-195, covers 44 types of electrodes. It gives applications, procedures, recommended currents, physical properties and sizes. Fully illustrated.

59. WELDING EQUIPMENT—National Cylinder Gas Co. 5-page illustrated leaflet treats types of welding outfits for semi-automatic and automatic welding, with direct current.

60. RADIOGRAPHY — North American Philips Co., Inc. 12-page booklet "Norelco X-ray for industry" contains operating and application data on six different types of radiography units. Illustrations and charts included.

61. ACETYLENE CYLINDER — Norris-Thermador Corp. Descriptive literature treats types of acetylene cylinders available, providing illustrations of models, sizes and specifications.

62. TURNTABLES—Eisler Engineering Co., Inc. 32-page illustrated catalog describes different models of indexing turntables and variable speed controls.

63. WELDING ACCESSORIES — K-G Equipment Co. New accessories catalog is companion piece for standard welding, cutting equipment catalog. Details types of accessories needed for efficient welding.

64. PLATE CLAMP—Buck Mfg. Co. Three-color illustrated folder discusses "Bux" magnetic plate clamp as well as magnetic drill presses, drill vises, including specifications for the weldor's use.

65. WELDING CHART—Eutectic Welding Alloys Corp. New "Selec-Tic" welding shop wall chart (TIS 2616) describes 150 low temperature welding alloys. The two-color chart lists torch and arc welding applications for a variety of metals. Specific recommendations are given for repairing, etc.

66. SPRAY EQUIPMENT—General Scientific Corp. Bulletin IS-56A discusses electrostatic ionic spray equipment for coating metallic and non-metallic items.

67. WELD FASTENERS—The Ohio Nut & Bolt Co. Bulletin 563 gives complete listing and dimensional information on weld fasteners and adjusting screws. Included are 78 new parts.

68. WELDING PLATES—Stahl Equipment Co. 4-page leaflet illustrates and describes welding and assembly platens with schematic drawing of welding platen and illustrations of actual usage.

69. WELDING TORCH—Marquette Mfg. Co., Inc. Illustrated folder details, in 4 pages, types of "Aero-Jet" torches, tips and outfits, including usages.

70. GOGGLES, HELMETS — Willson Products Division. 7-page illustrated booklet treats eye and face protective equipment—goggles, helmets, respirators, face shields.

71. SALAMANDERS — Insto-Gas Corp. Handy catalog illustrates and describes salamanders, lead welding torches, blow pipes, soldering irons, with accessories.

72. WELDING HELMETS—Mine Safety Appliances Co. Bulletin 030-4 treats the "S" line of welding helmets made of plastic-impregnated glass fibre. Illustrations display different models, including helmet and safety hat combination.

73. WELDING FITTINGS—The Babcock & Wilcox Co. 6-page folder, FB-502, describes line of carbon, alloy and stainless steel seamless welding fittings and forged steel flanges, giving types and sizes and uses.

74. TEMPERATURE CONTROL — The Bristol Co. 7-page bulletin TB200 describes automatic temperature controllers for temperatures from -125 to 1,000 F.

75. BARREL FINISHING—Norton Co. Revised 76-page booklet (Form 501) treats barrel finishing with "Tumblex" abrasives. It provides data on types of barrels, abrasive selection, cleaners, time cycles. Included are photographs, case histories of deburring, finishing.

76. FLASH-BUTT WELDER—Thomson Electric Welder Co. Illustrated bulletin 320 treats the "F-3" series flash-butt welders for automatic welding.

77. SPOT WELDERS—Aro Spot Welders Div. 4-page illustrated folder describes types of spot welding guns, with types of electrodes and specifications.

78. WELDOR'S HAMMER—Bernard Welding Equipment Co. 4-page illustrated brochure details "Multi-Pic" weld cleaning hammer, with types of models.

79. OXYACETYLENE WELDING—Suffolk Iron Foundry (1920) Ltd. Booklet discusses torches, regulators, flux, electrodes, rods for oxyacetylene welding, hardfacing, etc.

80. TRANSFORMER—The Taylor-Winfield Corp. Specification sheet 5-780 describes maintenance of hydraulic pressures with booster for use on portable welding guns and spot welders; specification sheet 9-012 describes transformer for multi-electrode and special resistance welding applications.

81. ELECTRODE HOLDER—Lenco Inc. Folder describes and illustrates "Hi-Amp" electrode holders and cable connectors as well as ground attachments.

82. PLASTIC CUTTING — Porter-Cable Machine Co. 26-page manual (Form 2538-X) describes cutting plastic with model "148" bayonet saw.

83. ARC WELDING—Hobart Bros. Co. 18-page issue of *Hobart Welding News* (Vol. XIII, No. 3) contains illustrated case histories of arc welding.

84. INDUCTION HEATING — Induction Heating Corp. Illustrated sheets (G5, G6, G7, G14, G15) discuss brazing using induction heating.

85. SOLENOID VALVES — Automatic Switch Co. 32-page condensed valve catalog No. 201 describes line of 2, 3 and 4-way solenoid valves, including engineering information, flow charts, operation and construction details.

86. WELDED TUBING—Republic Steel Corp. Pocket-size booklets contain tolerance tables and size ranges for square, rectangular and round carbon, stainless steel welded "Electrunite" mechanical tubing.

87. WELDERS—Mid-States Welder Mfg. Co. Catalog sheet (MVCRA-775) describes "Viking" Tig (tungsten inert-gas) a-c welder; sheet (310-755) describes "Metal Zipper" a-c welders for heavy production, general shop, maintenance welding.

88. WELD INSPECTION—Balteau Electric Corp. Illustrated sheet describes "Baltograph 120" industrial X-ray unit, light, portable, can radiograph spot welds.

89. COMPRESSOR ANALYSIS—Worthington Corp. Bulletin PC-509 P helps to locate and correct common air-cooled and water-cooled compressor troubles. Cartoon sequence pictures full description of such troubles.

90. WELDING CURTAINS — Frommelt Industries. Catalog sheet discusses welding curtains for booth and production welding, also protective covers.

91. ELECTRODE — The International Nickel Co., Inc. The "Inco-Rod A" welding electrode is described in illustrated booklet (19M 2969). Electrode is for welding stainless steels, high-nickel alloys.

92. BRAZING—Handy & Harman. Bulletin 11-A discusses brazing cemented carbide tips with silver brazing alloy "Easy-Flo No. 3." Treated step-by-step, with illustrations.

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125. Airline Welding & Engineering—Information on how to make fusion butt welding a "push-button" operation.

126. Air Reduction Sales Co.—Data and free sample of "Easyarc 10" all-position 6010 electrode with iron powder coating.

127. Alloy Rods Co.—Informative "Data Sheets" on "Atom-Arc" 7016 electrodes.

128. All-State Welding Alloys Co., Inc.—Step-by-step guide, "Instruction Manual," for operators who weld, braze, solder, tin and cut without oxygen.

129. Aluminum Co. of America—Informative books on how easy it is to weld, braze or solder aluminum.

130. American Brass Co.—Publication B-13 on braze welding.

131. Ampco Metal, Inc.—Information on "Ampco-Weld" resistance-welding products.

132. Ampco Metal, Inc.—Bulletin W-17 on longer life of five grades of "Ampco-Trode" electrodes.

133. Arcos Corp.—Information on stainless electrodes.

134. Arcos Corp.—Details on chrome-moly electrodes.

135. Aronson Machine Co.—Detailed engineering data on positioners, turning rolls, turntables and magnetic welding clamps.

136. Aro Spot Welder Div.—Illustrated literature on portable spot welders.

137. Atlas Welding Accessories, Inc.—Details on 30 models of "Tomahawks" for weld cleaning jobs.

138. Becker Bros. Carbon Co.—Catalog on carbon brushes for all makes of welding equipment gives complete specifications, factory numbers, scaled drawings, etc.

139. Bernard Welding Equipment Co.—Information on how "Cable-Splint" solves cable fraying problems.

140. Chicago Hardware Foundry Co.—Data on "Fuse-Well" cast iron welding rods and electrodes for welding cast iron.

141. Columbia Electric Mfg. Co.—Catalog WE-400 on the "Tong Test" a-c/d-c ammeter.

142. Contour Marker Corp.—Information and instruction book on laying out pipe joints.

143. Crescent Co., Inc.—Full information on "Carol Dynapower" welding cable for outstanding toughness and flexibility.

144. Delta Welder Corp.—Details on how Delta Welder equipment developments and machines are saving time and money for nationally known manufacturers in high production resistance welding.

145. Drawalloy Corp.—Information on precision-drawn hardfacing and welding wire.

146. Eastman Kodak Co.—Details on how "Type AA2" X-ray films can save you time and extend the possibilities of your present radiographic equipment.

147. Eisler Engineering Co., Inc.—Information on resistance-welding and general welding equipment.

148. Erico Products, Inc.—Details on "Caddy" arc welding accessories and "Cadweld" connections.

149. Eutectic Welding Alloys Corp.—Various welding booklets on cast iron, soldering, etc.

150. Federal Machine & Welder Co.—Information on engineering, design and development in resistance welding.

151. Fibre-Metal Products Co.—Bulletin 49 on insulated "Eureka" holders, face shields, safety helmets, head rest goggles, weld cleaning hammers, "Freshair" systems and "Quick-Lok" welding helmet attachment.

152. Foote Mineral Co.—Information on "RZ-40" iron powder coating for welding electrodes and other specialized chemicals, minerals and ferralloys for welding rod coating materials.

153. General Electric Co.—Bulletin GEA-6243A on versatile, reliable and economical a-c arc welders.

154. General Electric Co.—Information on how new "Strikeasy 610" iron-powder E-6010 electrode produces better welds in all positions.

155. General Electric Co.—Information on new and remanufactured ignitrons.

156. General Split Corp.—Details on work gloves of "Weldtan" leather.

157. H & M Pipe Beveling Machine Co.—Detailed information on "Model O" pipe beveler.

158. Handy & Harman—Distributor List and Bulletin 20 on high-strength, speed and economy in "Easy-Flo" brazing.

159. Hobart Bros. Co.—Information on a-c/d-c combination, electric drive, gas engine drive and d-c rectifier welders.

160. Hobart Bros. Co.—Details on a-c welder/a-c power combination, "Contractor's Special" and "Husky Boy" welders.

161. Hobart Bros. Co.—Free booklet and data on non-profit arc welding school for beginners or "brush-up" courses in specialized welding.

162. Hobart Bros. Co.—Catalog on all types of gas and electric drive manual arc welders and details on "Rocket 14" all-position, iron-powder electrodes.

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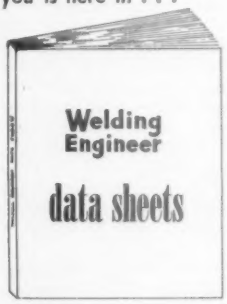

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163. Hobart Bros. Co.—Details on automatic and semi-automatic submerged arc and inert gas arc welding and tractor type submerged arc welding.

164. Independent Engineering Co., Inc.—Details on how to reduce cylinder handling with gas supply trailers.

165. International Nickel Co., Inc.—Data on "Inco-Rod A" electrodes for welding dissimilar alloys.

166. International Nickel Co., Inc.—Technical Bulletin T-2, "Fusion Welding of Nickel and High Nickel Alloys," on the "140" series of electrodes.

167. Jackson Products, Inc.—Information on arc welding and safety accessories.

168. K-G Equipment Co., Inc.—Information and prices on simple, accurate and dependable "Flow" functional flowmeter.

169. Krembs & Co.—Flux chart and state which sample fluxine you desire.

170. Leneo, Inc.—Details on "Hi-Amp" electrode holders.

171. Lincoln Electric Co.—Bulletin SB-1343, "Now you can select the Ideal Arc (welder) for Every Job!"

172. Lincoln Electric Co.—Bulletin SB-1364 on a-c and d-c single-phase current welders for shop production and maintenance.

173. Lincoln Electric Co.—Bulletin SB-1355 on how new automatic "LAF-3" for d-c welding and "LAF-4" for a-c welding "Lincolnweld" welders simplify tooling and increase production dependability.

174. Linde Air Products Co.—Details on "Purox W-200" welding blowpipe.

175. Linde Air Products Co.—Illustrated literature on wide variety of standard and custom "Unionmelt" welding assemblies.

176. Mallory & Co., Inc., P. R.—Resistance welding catalog on electrodes, holders, seam welding wheels, dies, castings and forgings.

177. Metal & Thermit Corp.—Information on "Kel-Ray" projectors for sound welds in fabricating equipment requiring radiographic inspection.

178. Miller Electric Mfg. Co., Inc.—Information on combination a-c/d-c welders.

179. National Carbide Co.—Write for name and address of nearest supplier.

180. National Welding Equipment Co.—40-page color brochure on cutting torch.

181. Norris-Thermador Corp.—Specifications, sizes and prices of acetylene cylinders.

182. North American Philips Co.—Name of nearest dealer and folder, prices and information on tig welding.

183. Norton Co.—Data on new "44 Alundum" abrasive wheels for grinding in the bonds, wheel types and sizes you need.

184. Page Steel & Wire Div.—Folder DH-1277 on gas welding rods.

185. Page Steel & Wire Div.—Folder DH-402A on submerged-arc and inert-gas welding wire.

186. Picker X-Ray Corp.—Outline your problem sending typical samples of inspection problems for possible solution through gamma or X-ray radiography.

187. Rankin Mfg. Co.—Further details on hardfacing electrodes and rods.

188. Shawinigan Products Corp.—Information on carbide.

189. Shoot-A-Lite Corp.—Literature on safety gas lighter for welding and cutting torches.

190. Smith Corp., A. O.—New catalog on mild steel and iron-powder electrodes.

191. Smith Corp., A. O.—Complete studies on carbon-dioxide hand gun welding versus manual and other semiautomatic processes.

192. Smith Corp., A. O.—Bulletin MW-182 on complete line of power sources to meet any need—a-c, d-c or constant potential for any automatic or semiautomatic process.

193. Steel Sales Co.—Details on how "Silvaloy" silver-brazing alloy preforms aids production brazing.

194. Stoody Co.—Information on the hardfacing of all types of crushing equipment.

195. Stulz-Sickles Co.—Details on "Manganal" mill length hot rolled wedge bars.

196. Tempil Corp.—Information on, and sample of pellets (state temperatures of interest) of temperature indicating materials for all heat-dependent operations.

197. Tube Turns, Inc.—Booklet, "Economics of Welding Small, Noncritical Pipe."

198. Tweco Products, Inc.—Details on "Tweco-Lite" aluminum welding cable.

199. United Wire & Supply Corp.—Facts on "Phoson" brazing alloys.

200. Vickers Electric Div.—Information on "Controlarc" d-c welder that gives you remote control of current and type of arc.

201. Victor Equipment Co.—Descriptive Bulletin 353 on accuracy and speed with which "Duplicutter" handles cuts.

202. Victor Equipment Co.—Bulletin 358 on hardfacing with automatic rods for steadier arc and voltage and smoother, faster application.

203. Westinghouse Electric Corp.—Free survey of your tube requirements and information on "Ignitron 'Trade-In' Salvage Plan" for reducing maintenance costs.

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HOME VIEW OF CABLE AS TOLD BY A BABY

Now, folks, you may not think I'm the happiest kid in the world from looking at my picture here, but you ought to see me light up when my Dad comes home. Boy, he's just about the best Dad in the whole wide world. Or as Dave Garroway would say, the whole wide, wide world.

He grabs me up the first thing when he comes in the house and tosses me way up in the air. I'm not afraid a bit, 'cause he always catches me real easy like. Mom comes runnin' in and he gives her a big hug and kisses her right on the mouth. I don't understand what gets into grown folks kissin' like that, but they seem to like it and I like to see them happy.

It wasn't always like this either. In fact, it was only a short while ago that Dad just wasn't much fun. He'd come draggin' home in the evening and hardly had a smile for me, let alone a big toss in the air. Oh, he kissed Mom all right, but it was hardly more than a little peck, and neither one of them seemed to get much of a kick out of it. He was takin' them vitamins and things but they never seemed to do him much good.

Then a few weeks ago things really got better. Dad began coming home just like I told you in the beginnin', with lots of life and energy and gee, he's a lot of fun. I sure didn't know what happened but I was awful glad. Mom noticed it right away and I heard them talkin' about it the other night when I'd just about killed my bottle and was supposed to be asleep.

"You Mean You Haven't Heard About Tweco-Lite!"

I guess I should of told you right off the beginnin' that Dad has a real important job welding in one of the car factories. He's always liked it a lot but it's real hard work and he was usually worn down by nighttime.

Like I was sayin', he and Mom was a talkin' the other night. She was real happy and tellin' him how much more energy he seemed to have now.

He was sayin' he had a real smart boss and the other day he came in with a new thing for the weldors to use. I don't know nothin' about, but I think the name was Tweco-Lite. I was awful sleepy, but that's what it sounded like. Whatever it is, I sure am glad.

If you, too, haven't heard about Tweco-Lite Aluminum Welding Cable, write Tweco Products, Inc., Box 666, Wichita, Kansas, for the complete story.

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